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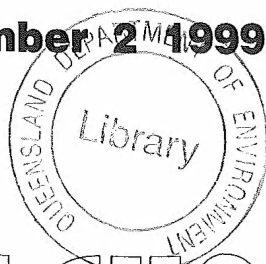
Queensland Herbarium



QUEENSLAND GOVERNMENT
**Department of
Environment and Heritage**

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Environment and Heritage**

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A revision of the *Babingtonia virgata* (J.R.Forst. & G.Forst.) F.Muell. complex (Myrtaceae) in Australia

A.R. Bean

Summary

Bean, A.R. (1999). A revision of the *Babingtonia virgata* (J.R.Forst. & G.Forst.) F.Muell. complex (Myrtaceae) in Australia. *Austrobaileya* 5(2): 157–171. Seven Australian species related to *Babingtonia virgata* are described as new viz. *B. angusta*, *B. collina*, *B. crassa*, *B. brachypoda*, *B. bidwillii*, *B. papillosa* and *B. similis*, and one new combination is made, *B. pluriflora*. All species are described and illustrated and notes are provided on their distribution, habitat and conservation status. *Babingtonia virgata* is considered to be endemic to New Caledonia. A description of it is provided for comparative purposes, and its relationship to Australian taxa is discussed. A revised key is provided to all species of *Babingtonia* from eastern Australia, and for the Australian members of the *B. virgata* complex.

Keywords: Myrtaceae, *Baeckea*, *Babingtonia*, *Baeckea virgata*, *Babingtonia virgata*, *Babingtonia angusta*, *Babingtonia collina*, *Babingtonia crassa*, *Babingtonia brachypoda*, *Babingtonia bidwillii*, *Babingtonia papillosa*, *Babingtonia similis*, taxonomy, keys, Australia, New Caledonia

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Introduction

The shrub now known as *Babingtonia virgata* was first collected by the Forsters from the island of New Caledonia in 1774, and later named by them as *Leptospermum virgatum*. The species was transferred by the younger Linnaeus to the genus *Melaleuca* in 1781, and then to *Baeckea* by Andrews (1810). In his discussion, Andrews refers to the presence of *Baeckea* species in New Holland (soon after to become known as Australia), but did not suggest the presence of *B. virgata* there. However, specimen determinations at the Herbarium, Kew, from that era suggest that that was the popular opinion. Schauer (1843) erected a new genus, *Harmogia*, to accommodate *B. virgata* and several other species, but did not comment on the distribution of any of the species. Both Mueller (1864) and Bentham (1867) ascribed *B. virgata* to eastern Australia as well as to New Caledonia. Mueller (loc. cit.) reduced his own species *Camphoromyrtus pluriflora* F.Muell. to *Baeckea virgata*, then later in the same publication made the combination *Babingtonia virgata*, which is accepted here. Bentham (loc. cit.) established a broad generic and species concept, reducing *Harmogia* and *Babingtonia*

to sectional status under *Baeckea*, and included a wide range of Australian and New Caledonian forms under the name *Baeckea virgata*. Bailey (1900) described a new variety, *B. virgata* var. *parvula* (described here as *Babingtonia bidwillii*), but no other taxa in the group have since been described from Australia. Dawson (1992) revised the New Caledonian members of the *Baeckea virgata* group, and recognised 4 species in it. *Babingtonia* was reinstated by Bean (1997) and revised for eastern Australia and New Caledonia, with the exception of the *B. virgata* complex which is here treated.

B. virgata and its allies form a taxonomically very difficult group as the species involved are still apparently evolving, and there is continuing exchange of genetic material between populations/taxa in some areas. This results in the blurring of species boundaries, with some species pairs intergrading over a distance of 50–100 kilometres. As a result, it is sometimes very difficult to allocate some specimens to a particular taxon.

Taxonomic and ecological characteristics

Within the genus *Babingtonia*, the Australian members of the *B. virgata* group of species are distinguished by the following combination of

characters: trunk fluted on large specimens; leaves entire, thin-textured, with length more than 2.5 times the width; inflorescences usually 3 or 7 (occasionally 9-, rarely 1-) flowered; ovules more than 15 per loculus, radially arranged around the placenta.

Within the numbering scheme presented by Bean (1997), all of the Australian taxa presented in this paper can be placed between No. 5 (*B. virgata*) and No. 6 (*B. tozerensis*).

In Australia, species in the *B. virgata* group may occupy mesic habitats on creekbanks or as understorey in eucalypt forests, or paradoxically they may occupy xeric sites on rocky outcrops. In all cases the soils are sandy or skeletal and the available nutrients are comparatively low.

Methods

This study is based upon the examination of herbarium material from A, BM, BRI, G, GH, K, MEL, NE, NSW, HO, P, and WELTU. Stipe and peduncle lengths were measured on flowering material, as the peduncle (and possibly the stipe) elongate after anthesis, and measurements taken on fruiting material can be quite different.

Measurements of leaves and branchlets were taken from dried herbarium material; branchlet descriptions are based on young material (within 50 mm of shoot apices). Measurements of floral parts are based either on material preserved in spirit or material which has been reconstituted by boiling.

All species have been examined in the field.

Key to the *Babingtonia* species of eastern Australia

1. Leaf margins crenulate or conspicuously irregular 2
 Leaf margins entire or minutely denticulate 3
2. Leaves 4.2–6.1 mm long, crenulate. Mt Buffalo, Victoria **B. crenulata**
 Leaves 1.2–2.4 mm long, margins conspicuously irregular. Central–northern
 NSW **B. cunninghamii**
3. Leaves more than 1.5 mm wide 4
 Leaves less than 1.5 mm wide 12
4. Inflorescences 3- or 7-(9)-flowered 5
 Inflorescences 1-flowered 11
5. Leaf midrib impressed on upper surface; quadrangular branchlets with
 undulating surface and crenate margins **B. pluriflora**
 Leaf midrib not impressed on either surface; quadrangular branchlets smooth
 or papillose, with entire margins 6
6. Oil glands on branchlets raised, papillose 7
 Oil glands on branchlets not raised or impressed 8
7. Flower stipes 2–3.5 mm long; petals 2.5–3 mm across **B. papillosa**
 Flower stipes 3.5–5 mm long; petals 3–3.5 mm across **B. tozerensis**
8. Most inflorescences 3-flowered 9
 Most inflorescences 7-flowered 10
9. Leaves obovate; flower stipes 1.2–2.5 mm long **B. brachypoda**
 Leaves elliptical; flower stipes 2.5–4.5 mm long **B. bidwillii**
10. Leaves 1.7–2.5 mm wide; bracts up to 1.4 mm long **B. collina**
 Leaves 2.5–3.5 mm wide; bracts 1–2.5 mm long **B. crassa**

11. Petals 2.6–3.0 mm wide; hypanthium muricate; leaf length/breadth ratio 1.7–2.2 **B. prominens**
Petals 1.5–2.3 mm wide; hypanthium smooth; leaf length/breadth ratio 1.2–1.7 **B. silvestris**
12. Leaf apex uncinata **B. behrii**
Leaf apex acute or obtuse 13
13. Inflorescences (1-) 3–7-flowered 14
Inflorescences consistently 1-flowered 15
14. Leaves plano-convex to concavo-convex, 5.5–10 × 0.5–1.0 mm **B. angusta**
Leaves flat, 9–15 × 1.1–1.5 mm **B. similis**
15. Outer sepals acute or acuminate, 0.8–1.8 mm long 16
Outer sepals obtuse, up to 0.3 mm long, or absent 18
16. Leaves broadly ovate, 0.9–1.5 mm long; hypanthium smooth **B. squarrulosa**
Leaves linear to lanceolate, 2.5–6.5 mm long; hypanthium smooth or muricate 17
17. Stamens 5–9; ovules 8 or 9 per loculus; leaves 0.7–1.4 mm wide **B. granitica**
Stamens 11–13; ovules 12–14 per loculus; leaves 0.5–0.8 mm wide **B. odontocalyx**
18. Leaves obovate; pedicels 2.0–4.2 mm long; outer sepals present; hypanthium 5-ribbed **B. jucunda**
Leaves linear; pedicels 0.4–1.0 mm long; outer sepals absent; hypanthium smooth **B. densifolia**

Key to the Australian species allied to *Babingtonia virgata*

1. Leaf midrib impressed on upper surface; quadrangular branchlets with undulating surface and crenate margins **4. B. pluriflora**
Leaf midrib not impressed on either surface; quadrangular branchlets smooth or papillose, with entire margins 2
2. Oil glands on branchlets raised, papillose **8. B. papillosa**
Oil glands on branchlets not raised or impressed 3
3. Most inflorescences 3-flowered 4
Most inflorescences 7-flowered 7
4. Leaves obovate; flower stipes 1.2–2.5 mm long **7. B. brachypoda**
Leaves elliptical to linear; flower stipes 2.5–4.5 mm long 5
5. Leaves plano-convex to concavo-convex, 0.5–1.0 mm wide **3. B. angusta**
Leaves flat, 1.1–2 mm wide 6
6. Leaves 9–17 mm long; bracts up to 1.3 mm long **2. B. similis**
Leaves 4.5–6.5 mm long; bracts 1.2–2 mm long **1. B. bidwillii**
7. Leaves 1.7–2.5 mm wide; bracts up to 1.4 mm long **6. B. collina**
Leaves 2.5–3.5 mm wide; bracts 1–2.5 mm long **5. B. crassa**

Babingtonia virgata (J.R.Forst. & G.Forst.) F.Muell., *Fragm.* 4: 74 (1864); *Leptospermum virgatum* J.R.Forst. & G.Forst., *Char. Gen. Pl.* 48 (1776); *Melaleuca virgata* (J.R.Forst. & G.Forst.) L.f., *Supp. Pl.* 343 (1781); *Baeckea virgata* (J.R.Forst. & G.Forst.) Andrews, *Bot. Repos.* 9: t. 598 (1810); *Harmogia virgata* (J.R.Forst. & G.Forst.) Schauer, *Linnaea* 17: 238 (1843). **Type:** New Caledonia, in 1774, *J.R. Forster & G. Forster* (holo: K).

Leptospermum parvulum Labill., *Sert. Austro-Caledon.* 62, t. 61 (1825); *Baeckea parvula* (Labill.) DC., *Prodr.* 3: 229 (1828). **Type:** New Caledonia, in 1793, *J.J. Labillardiere* (holo: FI).

Baeckea parvula var. *latifolia* Brongn. & Gris, *Bull. Soc. Bot. France* 11: 184 (1864). **Type:** Gatope, New Caledonia, *Vieillard* 514 (lecto: P, fide Dawson (1992)).

Baeckea obtusifolia Brongn. & Gris, *Bull. Soc. Bot. France* 11: 185 (1864). **Type:** Balade, New Caledonia, *Vieillard* 445 (P n.v., photo BRI).

Shrub to 3 m high. Bark unknown. Branchlets quadrangular, with convex surfaces, not flanged, white or grey, margins entire or sinuate; oil glands absent. Leaves petiolate; petiole 0.9–1.6 mm long; lamina lanceolate, oblanceolate or elliptical, 5–11 mm long, 1.0–2.0 mm wide, concolorous, straight, flat or longitudinally striate, not keeled, oil glands obscure on both surfaces, 0.25–0.5 mm apart, midrib rarely faintly visible on abaxial surface, invisible on adaxial surface, intramarginal vein not visible, apex obtuse or acute. Inflorescence axillary, 3–(4–7)-flowered; peduncles 2.5–9.0 mm long; stipes 1.5–5.0 mm long; bracts 2, caducous, narrowly deltate, to 1.5 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, glandular, obconical, 1.2–1.5 mm long, fused to the ovary except at top; calyx lobes simple; inner lobe semi-orbicular, c. 0.8×1.5 mm, thin or rather thick, margins entire; outer lobe absent. Corolla up to 7 mm across; petals broadly ovate to orbicular, 2.0–3.0 \times 1.9–2.2 mm, white, oil glands present; margins entire. Stamens 7–11, in groups of 1–

3 opposite the calyx lobes, stamen opposite to centre of calyx lobe often shorter than remainder; filaments terete, 0.5–0.8 mm long, geniculate, with brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscent by small divergent slits, with loculi free. Style terete, up to 1.0 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-locular; floral disc flat; ovules 12–16 per loculus, arranged radially around placenta. Fruit hemispherical, 1.5–1.8 \times 2.1–2.8 mm, valves broadly deltate, not woody, exserted. Seeds semi-discoid, c. 0.75 mm long, brown, with flat sides and rounded backs, finely reticulate (Fig. 1 T–V).

Selected specimens: New Caledonia. 29 km E of Noumea on the road to Yate, Jan 1978, *Armstrong* 1175 (BRI, NSW); Barrage de la Dumbea, Nov 1977, *Bamps* 5727 (K); Mt Tchinguou, Aug 1965, *Bernardi* 10402 (K); Col d'Amoss, Dec 1977, *Dawson* s.n. (WELTU); Col de Boghen, Dec 1952, *Everist* s.n. (BRI); SW base of Mt Dore, Sep 1963, *Green* 1129 (K); Mt Boulinda, Nov 1977, *Jaffre* 2005 (K, P); Ouen Toro hill, Noumea, Dec 1991, *Kelch* 1666 (NSW); Isle of Pines, Oct 1853, *MacGillivray* (K); Sommet est de la Roche Ouaieme, Jul 1968, *McKee* 19191 (BRI, K, P); Col de Tiebo, Sep 1973, *McKee* 27418 (K, P); Haute Koealagouamba, Aug 1974, *McKee* 29057 (BRI, P); Mont Ouin, Aug 1974, *McKee* 29095 (K, NSW, P); Balabio, Tiaodmoin, Sep 1974, *McKee* 29294 (K, P); Paagoumene, Feb 1980, *McKee* 37807 (WELTU); Mt Koniambo, south of Voh, Oct 1982, *McPherson* 4993 (MO, NSW); lower reaches of Dumbea Valley, Nov 1982, *McPherson* 5207 (MO, NSW); Auf den Bergen bei Oubatche, Nov 1902, *Schlechter* 15519 (K); base of Mont Mou, Oct 1923, *White* 2077 (K).

Distribution and habitat: Endemic to New Caledonia and a few adjacent islands. It grows mostly on soils derived from schist or peridotite but also on serpentine alluvium (Dawson 1992).

Phenology: Flowers are recorded between August and February, while fruits are recorded from December to August.

Notes: *Babingtonia virgata* is most closely related to *B. leratii* (Schltr.) A.R.Bean and *B. procera* (J.W.Dawson) A.R.Bean from New Caledonia. It is less closely related to Australian species and can be distinguished from them by its thick and often longitudinally wrinkled leaves (when dried) with obscure oil glands, its convex branchlet internodes lacking oil glands, its shorter hypanthia, its simple calyx lobes and its 12–16 ovules per loculus (16–23 for Australian taxa).

1. *Babingtonia bidwillii* A.R.Bean sp. nov.
affinis *B. simili* A.R.Bean a qua foliis brevioribus et 2.5–4plo longioribus quam latoribus, bracteis 1.2–2.0 mm longis, et petalis saepe fimbriatis differt. **Typus:** Queensland. WIDE BAY DISTRICT: Yurol State Forest, 3 km north-west of Cooroy, 26 October 1993, A.R. Bean 6803 (holo: BRI; iso: L, MEL).

Baeckea virgata var. *parvula* F.M.Bailey, Queensl. Fl. 2: 585 (1900), nom. inval., nom. nud. ?

Babingtonia sp. (Yurol A.R. Bean 6803) in Henderson (1997).

Shrub or tree to 5 m high. Bark grey, persistent, scaly to fibrous. Branchlets quadrangular with flat sides, slightly flanged, brown, margins entire; oil glands present, not papillose. Leaves petiolate; petiole 0.6–1.0 mm long; lamina elliptical to obovate, 4.5–7.0 mm long, 1.3–2.0 mm wide, discolorous, straight, flat, not keeled, oil glands prominent, especially on lower surface, c. 0.25 mm apart, midrib faintly visible on abaxial surface, not visible on adaxial surface, intramarginal vein not visible, apex obtuse or acute and abruptly narrowed at apex, with a tiny caducous mucro. Inflorescence axillary, 3-flowered, rarely 4–7-flowered; peduncles 4.5–8 mm long; stipes 3.0–4.5 mm long; bracts 2, caducous, linear, 1.2–2.0 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, glandular, obconical, 1.5–2.0 mm long, fused to the ovary throughout; calyx lobes compound; inner lobe semi-elliptic, c. 0.5 × 1.2 mm, thin, margins entire or fimbriate; outer lobe rudimentary or occasionally conspicuous, 0.4–2 mm long, thick, erect, obtuse or acute. Corolla up to 8 mm across; petals broadly ovate to orbicular, 2.2–2.6 × 2.0–2.5 mm, white, oil glands present, margins entire or fimbriate. Stamens (6)7–10, in groups of 1–3 opposite the calyx lobes, stamen opposite to centre of calyx lobe shorter than remainder; filaments terete, 0.6–1.0 mm long, geniculate, with brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscing by pores, with loculi fused. Style terete, up to 1.0 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-locular; floral disc concave;

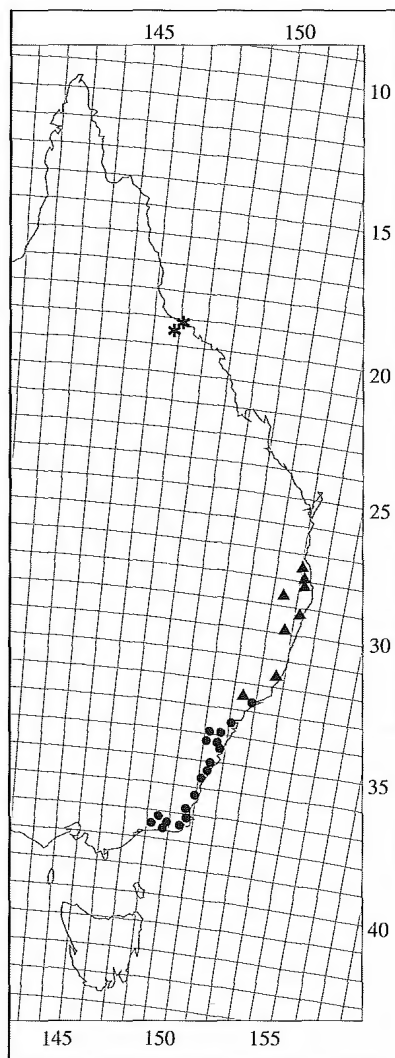
ovules 16–18 per loculus, arranged radially around placenta. Fruit hemispherical, 1.7–2.0 × 2.6–3.5 mm, valves broadly deltate, chartaceous, at rim level or slightly exerted. Seeds discoid, c. 0.6 mm long, brown, with flat sides and rounded backs, minutely reticulate (Fig. 1 C, D).

Specimens examined: Queensland. PORT CURTIS DISTRICT: Shoalwater Bay Training Area, Site SW06, E tributary of Werribee Ck, c. 1.5 km WSW of Mt Carroll, Sep 1993, McDonald 5732 & Scriffignano (BRI); c. 22 km from Agnes Waters, S of Gladstone, Nov 1976, Stanley 78183 & Ross (BRI). WIDE BAY DISTRICT: Yalanga station, Bates Road, NE of Kin Kin, Dec 1994, Bean 8152 & Grimshaw (BRI); N.E. Australia, 1848–53, Bidwill 102 (K); Wide Bay, tropical New South Wales, 1848–53, Bidwill (GH); Maryborough, Nov 1948, Clemens (BRI, GH, K); Cooloola, near Noosa, Teewah Ck, Dec 1971, Harrold C204 (BRI); Cooloola N.P., north-east of Banyan Creek, Oct 1982, McDonald 3764 & Williams (BRI); c. 1.5 km SW of Toogoom, Oct 1996, Sparshott KMS1020 & Baumgartner (BRI); Cooloola N.P., Noosa River at Cooloola Way bridge, Nov 1993, Telford 11981 & Nightingale (BISH, BRI, CANB, NSW); Burrum River, undated, Watson s.n. (A); Noosa River near Lake Como, Nov 1977, Williams 77272 (BRI). MORETON DISTRICT: Lefoes Road, Bli Bli, Dec 1996, Bean 11544 (BRI, NSW).

Distribution and habitat: *B. bidwillii* is found in coastal areas of Queensland from Shoalwater Bay to just north of Brisbane (Map 1). It grows in deep sandy soil in eucalypt forest of the coastal lowlands, often adjacent to areas of heathland. Associated species include *Syncarpia glomulifera* (Sm.) Nied. subsp. *glomulifera*, *Melaleuca sieberi* Schauer, *Eucalyptus resinifera* Sm., *E. intermedia* R.T.Baker and *Lophostemon suaveolens* (Gaertn.) Peter G. Wilson & J.T.Waterh.

Phenology: *B. bidwillii* flowers from October to December, and fruits from December to April.

Notes: *B. bidwillii* differs from *B. collina* A.R.Bean by its leaves 4.5–7 mm long (6.5–12.5 mm for *B. collina*) often with obtuse apex, its bracts 1.2–2 mm long (up to 1.4 mm for *B. collina*) and its mostly 3-flowered inflorescences. It differs from *B. similis* A.R.Bean by its shorter leaves which are 2.5–4 times longer than wide (8–10 times for *B. similis*), bracts 1.2–2 mm long (up to 1.3 mm long for *B. similis*) and the often fimbriate



Map 1. Distribution of *Babingtonia pluriflora* ●, *B. similis* ▲, *B. papillosa* *.

petals (entire for *B. similis*). Intergrades with *B. collina* occur north of Brisbane.

Conservation status: This taxon is not considered rare or threatened.

Etymology: The species epithet honours John Carne Bidwill (1815–1853), who collected the first known specimen of this species.

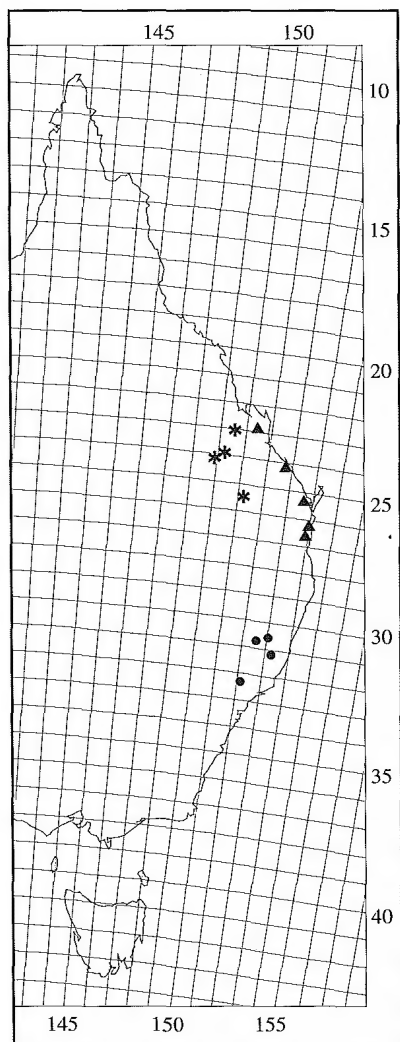
2. *Babingtonia similis* A.R.Bean sp. nov.
affinis *B. angustae* A.R.Bean a qua foliis
lterioribus planisque, et stipitibus 2.5–4.0

mm longis differt. **Typus:** Queensland. MORETON DISTRICT: Springbrook, south-west of Mudgeeraba, 16 January 1994, A.R. Bean 7314 (holo: BRI; iso: DNA, NSW).

Babingtonia sp. (Yatala P. Grimshaw+ G525) in Henderson (1997).

Shrub to 2 m high. Bark grey, persistent, scaly to fibrous. Branchlets quadrangular with flat sides, not flanged, grey, margins entire; oil glands present, not papillose. Leaves petiolate; petiole 0.6–1.0 mm long; lamina narrowly lanceolate, 9–15 mm long, 1.1–1.5 mm wide, discolorous, straight, flat, not keeled, oil glands prominent, especially on lower surface, c. 0.25 mm apart, midrib faintly visible on abaxial surface, invisible on adaxial surface, intramarginal vein not visible, apex acute. Inflorescence axillary, 3-flowered; peduncles 5.0–9.0 mm long; stipes 2.5–4.0 mm long; bracts 2, caducous, narrowly deltate, to 1.3 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, glandular, obconical, 1.5–2.0 mm long, fused to the ovary except at top; calyx lobes compound; inner lobe semi-elliptic or deltate, c. 0.7×1.5 mm, thin, margins mostly fimbriate; outer lobe rudimentary, c. 0.6 mm long, thick, obtuse. Corolla up to 7 mm across; petals broadly ovate to orbicular, $2.0\text{--}2.5 \times 1.8\text{--}2.5$ mm, white, oil glands present, margins entire. Stamens 8–10, in groups of 1–3 opposite the calyx lobes, stamen opposite to centre of calyx lobe shorter than remainder; filaments terete, 0.7–1.0 mm long, geniculate, with brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscent by small divergent slits, with loculi free. Style terete, up to 1.0 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-locular; floral disc concave; ovules 16–18 per loculus, arranged radially around placenta. Fruit hemispherical, c. 1.7×3.0 mm, valves broadly deltate, somewhat woody, exserted. Seeds semi-discoid, c. 0.75 mm long, brown, with flat sides and rounded backs, minutely reticulate (Fig. 1 R, S).

Specimens examined: Queensland. MORETON DISTRICT: Springbrook–Mudgeeraba road, Jan 1994, Bean 7319 (BRI);



Map 2. Distribution of *Babingtonia bidwillii* ▲, *B. crassa* ●, *B. brachypoda* *.

near defunct Lion Park, Pacific Highway, Yatala, Mar 1994, *Grimshaw* G525 & *Gibbs* (BRI); Oxenford, S of Brisbane, Aug 1930, *Hubbard* 3690 (K); Beechmont road, 12 km S of Nerang, Feb 1979, *Olsen* 826 & *Lebler* (BRI); 3 km S of Nerang along road to Beechmont, Aug 1985, *Reynolds & Cahway* s.n. (BRI); along Little Nerang Creek on road to Springbrook, Apr 1959, *Thorne* 20481 (BRI). **New South Wales.** NORTH COAST: Laurieton, Mar 1917, *Baker* s.n. (NSW); New Italy, Nov 1895, *Bauerlen* s.n. (NSW); Tooloom Falls, c. 5 km SSW of Urbenville, Nov 1987, *Coveny* 12806 et al. (BRI, MEL, NSW); Blandford Ck, Boundary Creek S.F., Feb 1979, *Floyd* AGF1210 (NSW); Beechwood, Hastings River, May 1915, *Maiden* s.n. (NSW); Black Hill, between Maitland and Newcastle, Jun 1979, *Martin* s.n. (NSW); banks of Tooloom Ck, Urbenville, May 1945, *White* 12775 (A).

Distribution and habitat: *B. similis* extends from the Brisbane area in south-eastern Queensland to near Newcastle in New South Wales (Map 2). It occurs in a wide range of habitats including *Melaleuca*-dominated open forest and eucalypt forest, and on rainforest margins with *Callicoma serratifolia* Andrews and *Acrotriche* sp.

Phenology: Flowers are recorded between January and March, while fruits are recorded from January to August.

Notes: *B. similis* is most closely related to *B. angusta* but differs from that by its discoloured leaves which are flat in cross-section (concolorous and plano-convex for *B. angusta*), and 1.0–1.5 mm wide (0.5–1.0 mm wide for *B. angusta*), and the flower stipes 2.5–4.0 mm long (1–3 mm for *B. angusta*). Intergrades may occur with *B. angusta* in some parts of northern New South Wales, with *B. collina* south of Brisbane, and with *B. pluriflora* around the Port Stephens–Newcastle area.

Conservation status: This taxon is not considered rare or threatened.

Etymology: The specific epithet is from the Latin *similis*, meaning like, resembling, similar; in reference to the similarity between this species and *B. angusta*.

3. *Babingtonia angusta* A.R.Bean sp. nov.

affinis *B. simili* A.R.Bean a qua foliis concoloris planoconvexis 0.5–1.0 mm latis et stipitibus 1–3 mm longis differt. **Typus:** New South Wales. NORTH COAST: 7 km SE of Coutts Crossing, 2 February 1995, A.R. Bean 8321 (holo: BRI; iso: A, CANB, K, MEL, NSW, P, PERTH, distribuendi).

Babingtonia sp. (Atherton A.R. Bean 5707) in Henderson (1997).

Baeckea sp. “Clarence River” in Elliot and Jones (1982).

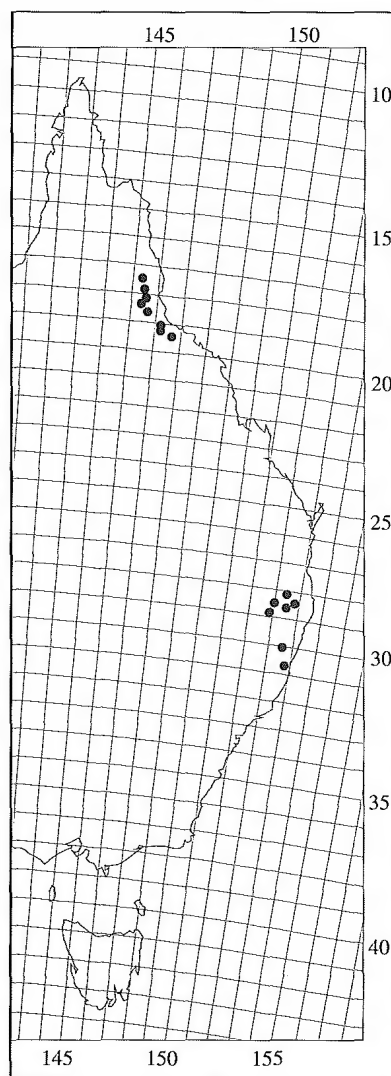
Shrub to 2.5 m high. Bark grey, persistent, scaly to fibrous. Branchlets quadrangular with slightly convex surfaces, not flanged, grey, margins entire; oil glands present, not papillose. Leaves petiolate; petiole 0.6–1.2 mm long; lamina narrowly-oblongate to linear, 5.5–10.0

mm long, 0.5–1.0 mm wide, concolorous, straight, plano-convex to concavo-convex, not keeled, oil glands visible on both surfaces, c. 0.5 mm apart, midrib not visible on either surface, intramarginal vein not visible, apex acute, acuminate or uncinat. Inflorescence axillary, 1–3 flowered; peduncles 2.5–7.5 mm long; stipes 1.0–3.0 mm long; bracts 2, caducous, narrowly deltate, 0.75–1.0 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, glandular, obconical, 1.5–2.0 mm long, fused to the ovary except at top; calyx lobes compound; inner lobe oblong to semi-elliptic, c. 0.7×1.5 mm, thin, margins entire or denticulate; outer lobe rudimentary, 0.4–0.7 mm long, thick, erect, obtuse. Corolla up to 8 mm across; petals orbicular, $2.0\text{--}2.8 \times 2.0\text{--}2.7$ mm, white, oil glands present, margins entire. Stamens 8–13, in groups of 1–3 opposite the calyx lobes, stamen opposite to centre of calyx lobe shorter than remainder; filaments terete, 0.7–1.1 mm long, geniculate, with brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscing by pores, with loculi fused. Style terete, up to 1.0 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-locular; floral disc concave; ovules 17–20 per loculus, arranged radially around placenta. Fruit hemispherical, $1.8\text{--}2.2 \times 3.0\text{--}3.5$ mm, valves broadly deltate, not woody, at rim level or slightly exserted. Seeds D-shaped, c. 0.6 mm long, brown, with flat sides and rounded backs, minutely papillose (Fig. 1 E, F).

Specimens examined: **Queensland.** COOK DISTRICT: Carrington Falls, SSW of Atherton, Jan 1993, *Bean* 5707 (BRI, CANB, K, L, MEL); powerline access road near Herberton, Nov 1995, *Ford* 1671 (QRS); Herberton Weir, Dec 1993, *Forster* PIF14481 (BRI, MEL, QRS). NORTH KENNEDY DISTRICT: Stony Creek, c. 2 km upstream from Wallaman Falls, W of Ingham, Jan 1997, *Bean* 11595 (BRI, NSW, QRS); Blencoe Falls, 30 miles [48 km] W of Cardwell, Nov 1967, *Boylard & Gillieatt* 583 (BRI, K); Koombooloomba area, Dec 1964, *Brooks* s.n. (BRI); Bluewater Creek near Bluewater, c. 25 km N of Townsville, 6 km from coast, Dec 1983, *Cattle* s.n. (BRI); Cameron Creek, on track east from Glen Ruth homestead, between Cardwell and Mt Garnet, Dec 1993, *Cumming* 12565 (BRI, MEL); 17 km past Paluma on road to Hidden Valley, Jan 1992, *Forster* PIF9476 (BRI, DNA, MEL, PERTH); Nitchaga Creek, 6 km S of Tully Falls, Dec 1993, *Forster* PIF14476 (BRI, MEL, QRS); "Taravale" near Hellhole Creek, 0.5–1.5 km E of homestead, Mar 1987, *Jacks* 8754 (BRI, CANB); Blencoe Ck, Nov 1975, *Travers* C17 (A, BRI, K). MORETON DISTRICT: Rocky Creek, Mt Barney N.P., Jul 1994, *Bean* 7762 & *Halford* (BRI); Mt Alford-Moogerah Dam road, just N of Mt

Alford, Mar 1994, *Grimshaw* G534 (BRI, NSW). DARLING DOWNS DISTRICT: Portion 90, Wyberba, near Girraween N.P., Sep 1993, *Bean* 6398 & *Forster* (BRI, NSW); Dalveen, Dec 1962, *Pedley* 1168 (BRI, NSW). **New South Wales.** NORTH COAST: Bean Creek Falls, 15 km S of Urbenville, Dec 1993, *Bean* 7235 (BRI, NSW); Hortons Creek, on Grafton-Armidale road, Apr 1994, *Bean* 7664 (AD, BRI, MEL, NSW); Nymboida River crossing, 5 km S of Nymboida, Apr 1994, *Bean* 7671 (BRI, NSW); near Sherwood, Oct 1981, *Coveny & Armitage* (NSW).

Distribution and habitat: *B. angusta* occurs in north Queensland between Atherton and Townsville, and also in south-eastern Queensland e.g. near Boonah and Stanthorpe,



Map 3. Distribution of *Babingtonia angusta* ●.

and in north-eastern New South Wales as far south as Sherwood (near Kempsey) (Map 3). *B. angusta* inhabits rocky sites on forested hillsides, or near (but not on) watercourses. Altitudes range between 200 and 1050 metres.

Phenology: Flowers have been recorded from November to March (with most from December to February) and fruits are recorded from March to September.

Notes: *B. angusta* is distinguished by its very narrow leaves, which are less than 10 mm long. A selected form of it has been cultivated in eastern Australia for several years as *Baeckea* sp. "Clarence River". *B. angusta* is most closely related to *B. similis* (see notes under that species), and intermediates may occur in some areas.

Conservation status: This taxon is not considered rare or threatened.

Etymology: The species epithet is from the Latin *angustus* meaning narrow, in reference to the leaves of this species.

**4. *Babingtonia pluriflora* (F.Muell.)
A.R.Bean comb. nov.**

Camphoromyrtus pluriflora F.Muell., Trans. & Proc. Victorian Inst. Advancem. Sci. (1855). **Type:** Victoria. Tambo River, February 1855, *F. Mueller* s.n. (lecto: MEL [MEL 73108] (here chosen); isolecto: BM, G, K).

Shrub to 4 m high. Bark grey, persistent, scaly to fibrous. Branchlets quadrangular with undulate surfaces, slightly flanged, white to pink, margins crenate; oil glands present, not papillose. Leaves petiolate; petiole 0.8–1.5 mm long; lamina lanceolate or elliptical, 10–29 mm long, 2.5–6.0 mm wide, discolorous, straight, flat, not keeled, oil glands prominent, especially on lower surface, c. 0.25 mm apart, equally numerous but less prominent on upper surface, midrib visible on abaxial surface, impressed on adaxial surface, intramarginal vein sometimes visible, apex acute or obtuse. Inflorescence axillary, 3–7(9)-flowered; peduncles 5.0–13.0 mm long; stipes 3.0–7.0 mm long; bracts 2, caducous, linear, c. 1.5 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, glandular, obconical, 1.7–

2.2 mm long, fused to the ovary except at top; calyx lobes compound; inner lobe semi-elliptic, c. 0.6×1.5 mm, thin, margins entire; outer lobe rudimentary, rarely conspicuous, 0.3–1.5 mm long, thick, erect, acuminate or obtuse, usually not exceeding inner lobe. Corolla up to 10 mm across; petals broadly ovate to orbicular, $2.5\text{--}3.7 \times 2.0\text{--}3.5$ mm, white, oil glands present, margins entire. Stamens 8–15, in groups of 1–4 opposite the calyx lobes, stamen opposite to centre of calyx lobe shorter than remainder; filaments terete, 0.6–1.0 mm long, geniculate, with pale brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscing by short slits, with loculi free. Style terete, up to 1.0 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-locular; floral disc concave; ovules 16–23 per loculus, arranged radially around placenta. Fruit hemispherical, $1.7\text{--}2.0 \times 2.5\text{--}3.5$ mm, valves broadly deltate, not woody, enclosed or at rim level. Seeds D-shaped, c. 0.75 mm long, brown, with flat sides and rounded backs, minutely papillose (Fig. 1 K–O).

Selected specimens: New South Wales. NORTH COAST: Port Stephens, Aug 1911, *Boorman* s.n. (BRI, NSW). CENTRAL TABLELANDS: Moorara Boss Hill, Mt Dunn road, 5.1 km NE of junction with Kanangra road, Nov 1985, *Benson* 2413 & *Keith* (NSW); Blue Mtns, undated, *Cunningham* s.n. (K). CENTRAL COAST: The Peaks, Burragorang, Aug 1905, *Cabbage* 1290 (NSW); Grose River, Sep 1906, *Maiden & Cabbage* s.n. (NSW); causeway on Glenbrook Ck, Jun 1952, *Whaite* 1162 (NSW). SOUTHERN TABLELANDS: Correa Creek, Bolero Creek, Sep 1898, *Baeuerlen* (NSW). SOUTH COAST: Nadgee Nature Reserve, Newtons Beach, Jan 1985, *Albrecht* 1507 (MEL, NSW); Araluen Valley, 8 miles [13 km] NW of Moruya, Dec 1961, *Briggs* s.n. (NSW); Bodalla S.F., Sep 1953, *Constable* 26515 (K, NSW); Woodburn S.F. on road to Pigeon House Mtn, WSW of Burrill Lake, Oct 1981, *Coveny* 11012 & *James* (BRI, NSW, PERTH); Araluen Valley, 7 miles [11 km] west of Moruya on the Moruya-Araluen road, Dec 1967, *Evans* 2770 (A, K, NSW); Narrabarba Creek crossing on Wonboyn road, c. 20 km SSW of Eden, Feb 1979, *Haegi* 1704 (BRI, K, MEL, NSW); Twofold Bay, Jan 1953, *Melville* 2726 & *Wakefield* (A, K, MEL, NSW). Victoria. Mt Dawson, north of Buchan, Mar 1984, *Albrecht* 364 (MEL, NSW); 15 miles [24 km] WNW of Bairnsdale, Jan 1960, *Aston* 508 (A); 19.2 km S of Gelantipy, on road to Buchan, Dec 1995, *Bean* 9432 & *Jobson* (BRI, MEL); Errinundra Plateau, near intersection of Helmers Rd with Errinundra Rd, Jan 1993, *Fletcher* 135 (MEL); Double Creek nature walk, 6.7 km NW of Mallacoota, Dec 1983, *Parkes* EG60b (CANB, MEL, PERTH); Little River Gorge lookout, NE of Butchers Ridge, Apr 1984, *Parkes* 214 (MEL).

Distribution and habitat: *Babingtonia pluriflora* is common along the coast and adjacent ranges from around Port Stephens in New South Wales to the Mitchell River (near Bairnsdale) in eastern Victoria (Map 1). It most commonly grows in eucalypt forests close to watercourses in deep sandy soils. However, it can sometimes grow on rocky outcrops where tree cover is sparse or absent, and where there is little or no soil. It occurs mostly at altitudes of 5 to 200 metres, but occasionally occurs as high as 800 metres. Some recorded associated species include *Eucalyptus sieberi* L.A.S. Johnson, *E. gummifera* (Gaertn.) Hochr., *Kunzea ericoides* (A.Rich.) Joy Thomps., *Kunzea ambigua* (Sm.) Druce and *Banksia integrifolia* L.f.

Phenology: The main flowering period is from October to January, but some flowering also takes place in the April to July period. Fruits are recorded from January to April.

Notes: *B. pluriflora* varies greatly in leaf size and shape, and grows in a wide range of habitats. Despite this, it has not been possible to recognise more than one taxon as no other characters consistently correlate with leaf dimension or habitat. It is closest to *B. similis* and apparently intergrades with that in the Port Stephens-Newcastle area. *B. pluriflora* differs from *B. similis* by its broader leaves with the midrib impressed on the adaxial surface, its crenate inflated branchlet internodes, its longer petals, longer hypanthium and fruiting valves enclosed or at rim level.

Specimens from Little River gorge and Mt Dawson in eastern Victoria have long acuminate outer calyx lobes, but in other respects are representative of *B. pluriflora*. Specimens from the Budawang Range in southern New South Wales (e.g. Telford 8833, 8905) have very short leaves and pedicels, and may prove to be taxonomically distinct.

Conservation status: This taxon is not considered rare or threatened.

5. *Babingtonia crassa* A.R.Bean sp. nov.
affinis *B. collinae* A.R.Bean a qua foliis

2.8–3.6 mm latis, hypanthio longiore, lobis exterioribus calycis lobos interiores excedentibus, et fructibus majoribus differt. **Typus:** New South Wales. NORTHERN TABLELANDS: Dangar's Falls, 20 km S of Armidale, 31 January 1995, A.R. Bean 8289 (holo: BRI; iso: K, MEL, NE, NSW).

Shrub to 2.5 m high. Bark grey, persistent, scaly. Branchlets quadrangular with flat sides, not flanged, grey, margins entire; oil glands present, not papillose. Leaves petiolate; petiole 1.0–1.5 mm long; lamina elliptical to lanceolate, 7–13 mm long, 2.5–3.5 mm wide, concolorous, straight, with internodes flat, not keeled, oil glands prominent on both surfaces, c. 0.25 mm apart, midrib visible on abaxial surface, not visible on adaxial surface, intramarginal vein not visible, apex acute. Inflorescence axillary, (3)7–9 flowered; peduncles 7–11 mm long; stipes 2–4 mm long; bracts 2, caducous, lanceolate, 1.0–2.5 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, densely glandular, obconical, 2.0–2.5 mm long, fused to the ovary except at top; calyx lobes compound; inner lobe semi-elliptic, c. 0.4 × 1.5 mm, thin, margins entire; outer lobe rudimentary, c. 1 mm long, thick, erect, acute. Corolla up to 7 mm across; petals orbicular, 2.0–2.8 × 2.0–2.8 mm, white, oil glands present, margins entire. Stamens 8–11, in groups of 1–3 opposite the calyx lobes, stamen opposite to centre of calyx lobe shorter than remainder; filaments terete, 0.5–1.0 mm long, geniculate, with brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscing by short slits, with loculi free. Style terete, up to 1 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-ocular; floral disc concave; ovules 18–20 per loculus, arranged radially around placenta. Fruit campanulate to hemispherical, 2.5–3.0 × 3.5–4.0 mm, valves broadly deltate, not woody, at rim level. Seeds not seen (Fig. 1 P, Q).

Specimens examined: New South Wales. NORTHERN TABLELANDS: Church Point, Wollomombi Falls, Feb 1979, Floyd 1207 (BRI, NE, NSW); Carrai Plateau edge, Sep 1984, King 353 (NSW); Dangar's Falls, Jan 1883, Statter s.n. (BM). NORTH COAST: McLeay River, undated, Beckler s.n. (K); Upper Carrow Brook, on Mount Royal road, c. 2 km below Cassel's road turnoff, Feb 1985, Faulding 31 (NSW).

Distribution and habitat: *B. crassa* is confined to a small area on the eastern edge of the northern tablelands of New South Wales, from east of Armidale to the Barrington Tops area (Map 2). It grows on rocky sites with little or no soil, sometimes on very steep slopes. Associated species include *Leptospermum petersonii* F.M.Bailey, *Callistemon sieberi* DC. and *Acacia ingramii* Tindale.

Phenology: Flowers have been recorded in January and February; fruits in February.

Notes: *B. crassa* is related to *B. collina*, but differs by its leaves 2.5–3.5 mm wide (1.7–2.5 mm for *B. collina*), outer calyx lobes exceeding inner lobes, hypanthium 2–2.5 mm long (1.5–2 mm for *B. collina*) and fruits 2.5–3 × 3.5–4 mm (c. 1.5 × 3 mm for *B. collina*). No intergrades with any other species are known.

Conservation status: The risk category of *Babingtonia crassa* according to the criteria of Chalson & Keith (1995) is "Priority for Investigation" (criterion a).

Etymology: The specific epithet is from the Latin *crassus*, meaning thick, in reference to the leaves of this species.

6. *Babingtonia collina* A.R.Bean sp. nov. affinis *B. bidwillii* A.R.Bean a qua foliis longioribus, inflorescentiis plerumque 7-floris, et bracteis plerumque longioribus differt. **Typus:** Queensland. MORETON DISTRICT: Marstaeller Rd, Karana Downs, 1 km S of Mt Crosby, 26 April 1995, L.H. Bird & C. Hays [AQ 635743] (holo: BRI; iso: AD, DNA, MEL, NSW).

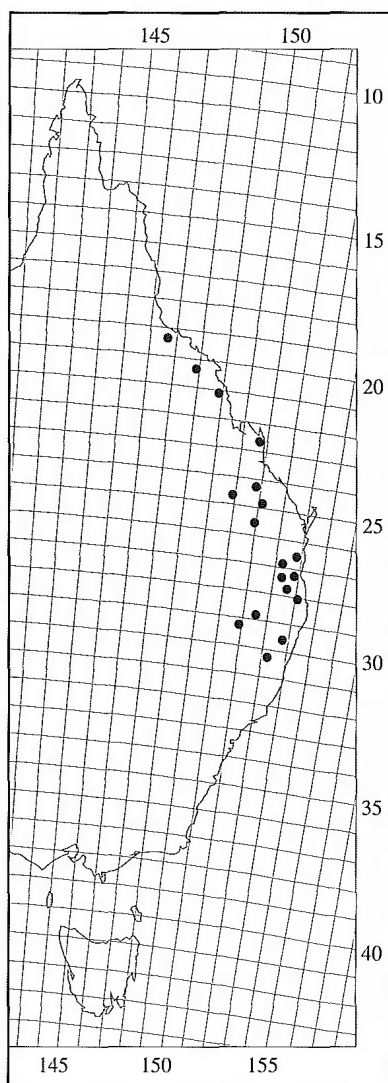
Babingtonia sp. (Mt Crosby L.H. Bird+ AQ635744) in Henderson (1997).

Shrub to 3 m high. Bark grey, persistent, scaly to fibrous. Branchlets quadrangular with flat sides, not flanged, grey, margins entire; oil glands present, not papillose. Leaves petiolate; petiole 0.6–1.3 mm long; lamina lanceolate, 6.5–12.5 mm long, 1.7–2.5 mm wide, slightly discoloured or concolorous, straight, flat, not keeled, oil glands prominent, especially on lower surface, c. 0.25 mm apart, midrib not visible on either surface, intramarginal vein not visible, apex acute, not abruptly narrowed at apex. Inflorescence axillary,

(3)–7 flowered; peduncles 5.0–9.5 mm long; stipes 2.5–4.0 mm long; bracts 2, caducous, deltate, to 1.4 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, glandular, obconical, 1.5–2.0 mm long, fused to the ovary except at top; calyx lobes simple; inner lobe semi-elliptic, c. 0.6 × 1.5 mm, thick or thin, margins entire; outer lobe absent. Corolla up to 8 mm across; petals orbicular, 2.0–2.8 × 2.0–2.8 mm, white, oil glands present, margins entire. Stamens (7)8–11, in groups of 1–3 opposite the calyx lobes, stamen opposite to centre of calyx lobe shorter than remainder; filaments terete, 0.6–1.0 mm long, geniculate, with brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscing by short divergent slits, with loculi fused. Style terete, up to 1.0 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-locular; floral disc concave; ovules 16–18 per loculus, arranged radially around placenta. Fruit hemispherical, c. 1.5 × 3.0 mm, valves broadly deltate, not woody, exerted or at rim level. Seeds semi-discoid, c. 0.75 mm long, brown, with flat sides and rounded backs, minutely reticulate (Fig. 1 G, H).

Selected specimens: QUEENSLAND. NORTH KENNEDY DISTRICT: Frederick Peak, 25 km SW of Townsville, May 1991, Bean 3206 (BRI, PERTH); summit of Mt Aberdeen, Aug 1993, Bean 6316 (BRI, MEL). SOUTH KENNEDY DISTRICT: Mount Jukes N.P., c. 30 km NW of Mackay, May 1991, Bean 3186 (BRI). PORT CURTIS DISTRICT: Mount Wheeler, 12 km SW of Yeppoon, Aug 1991, Batianoff WH9108022 & Robins (BRI, NSW); Mt Maria, c. 65 km NW of Bundaberg, Nov 1993, Bean 6987 (BRI). BURNETT DISTRICT: summit of Coongara Rock, S.F. 1344, Gayndah shire, Mar 1994, Thomas COO4 (BRI). WIDE BAY DISTRICT: Burnett River, 20 miles [32 km] W of Bundaberg, May 1983, Jansen 69 (BRI); Kenilworth Bluff, c. 8 km N of Kenilworth, Apr 1987, Sharpe 4662 & Bean (BRI). DARLING DOWNS DISTRICT: Severn River gorge between the falls and Low's Waterholes, Apr 1988, Thomas 283 (BRI). MORETON DISTRICT: Kureelpa Falls, 8 km W of Nambour, Jun 1995, Bean 8728 (BRI, MEL); 3.7 km E of Canungra, Jan 1995, Bean 8188 (BRI, MEL, NSW, QRS); Stumers road 1 km W of Mt Crosby, Apr 1995, Bird & Hays s.n. (BRI, DNA, NSW); Mt Blaine, 25 km S of Ipswich, Peak Crossing area, Apr 1993, Bird s.n. (BRI, NSW); Diana's Bath, D'Aguilar Range near Mt Byron, Apr 1995, Forster PIF16403 (BRI, MEL, NSW); between Brisbane and Redcliffe, Dec 1930, Hubbard 5510 (K, P); Aspley near Brisbane, Dec 1930, White 7147 (A, BRI, K). NEW SOUTH WALES. NORTH WEST SLOPES: Severn river, c. 4 km upstream of confluence with MacIntyre River, Jul 1991, Coveny 14411 & Makinson (BRI, CANB, MEL, NSW, PERTH). NORTH COAST: Rocky Creek, 28 km from Grafton towards Coaldale, Feb 1995, Bean 8340 (BRI, MEL, NSW); Copmanhurst, Nov 1917, Cheel s.n. (BRI, NSW); Codhole, Nymboida R., 23 km N of Dorrig, Dec 1977, Floyd AGF826 (NSW).

Distribution and habitat: The main distribution of *B. collina* is from around Yandina in southern Queensland to Dorrigo in New South Wales; however it extends in isolated populations to as far north as Frederick Peak near Townsville (Map 4). Altitudes are mostly 50 to 500 metres, but in north Queensland it reaches 900 metres. It may grow in shrubland on shallow soils derived from sandstone, rhyolite or granite, in eucalypt forest with shallow sandy soils, or in riparian communities, especially where there is outcropping rock.



Map 4. Distribution of *Babingtonia collina* ●.

Phenology: Flowers may be found between November and March, and sometimes as late as May. Fruits occur from January to August.

Notes: *B. collina* is related to both *B. similis* and *B. bidwillii* (see notes under those species). Collections of *B. collina* from Redcliffe, Aspley and Petrie in south-eastern Queensland tend towards *B. bidwillii* in leaf dimensions and flower number. *B. collina* and *B. similis* apparently intergrade in the area south of Brisbane.

Conservation status: This taxon is not considered rare or threatened.

Etymology: The species epithet is from the Latin *collinus*, relating to hills, in reference to the usual habitat of the species.

7. *Babingtonia brachypoda* A.R.Bean sp. nov.

affinis *B. collinae* A.R.Bean a qua foliis oblanceolatis apice obtusis, inflorescentiis 3-floris, stipitibus 1.2–2.5 mm longis et petalis fimbriatis differt. **Typus:** Queensland. LEICHHARDT DISTRICT: “Humboldt”, 45 km north-east of Rolleston, 26 January 1996, A.R.Bean 9541 (holo: BRI; iso: CANB, K, L, MEL, NSW, distribuendi).

Babingtonia sp. (Comet P. Rowland AQ634382) in Henderson (1997).

Shrub to 4 m high. Bark grey, persistent, scaly to fibrous. Branchlets quadrangular with flat sides, not flanged, grey, margins entire; oil glands present, not papillose. Leaves petiolate; petiole 0.7–1.3 mm long; lamina obovate, 5.5–9.0 mm long, 1.8–2.8 mm wide, concolorous, straight, flat, not keeled, oil glands prominent, especially on lower surface, c. 0.25 mm apart, midrib not visible on either surface, intramarginal vein not visible, apex obtuse or with a tiny caducous mucro. Inflorescence axillary, 3-flowered; peduncles 3–6 mm long; stipes 1.2–2.5 mm long; bracts 2, caducous, narrowly deltate, 1.1–1.4 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, glandular, obconical, 1.5–1.8 mm long, fused to the ovary except at top; calyx lobes simple; inner lobe semi-elliptic, c. 0.7 × 1.5 mm, thin, margins entire or fimbriate; outer lobe absent. Corolla up to 8 mm across; petals orbicular, 2.2–2.5 × 1.8–2.5 mm, white, oil

glands present, margins fimbriate. Stamens 9–12, in groups of 1–3 opposite the calyx lobes, stamen opposite to centre of calyx lobe shorter than remainder; filaments terete, 0.4–0.8 mm long, geniculate, with brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscing by short divergent slits, with loculi fused. Style terete, up to 1 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-locular; floral disc concave; ovules 16–18 per loculus, arranged radially around placenta. Fruit hemispherical, c. 2.0 × 3.5 mm, valves broadly deltate, somewhat woody, exserted. Seeds D-shaped, c. 0.8 mm long, brown, with flat sides and rounded backs, minutely reticulate (Fig. 1 A, B).

Specimens examined: Queensland. LEICHHARDT DISTRICT: “Humboldt”, 45 km north-east of Rolleston, Jan 1996, *Bean* 9543 (BRI, MEL); c. 30 km NW of Woorabinda, Henry Creek, May 1996, *Brushe* JB206 (BRI); “Humboldt” S of Blackwater, Jan 1997, *Fensham* 3002 (BRI); Precipice NP, Cables Ck catchment, Sep 1996, *Forster* 19788 (BRI); “Apis Creek”, W of Marlborough, Mar 1993, *Fensham* 1137 (BRI); “Humboldt” via Comet, Feb 1995, *Rowland* s.n. (BRI).

Distribution and habitat: *B. brachypoda* is known from a few sites near the towns of Rolleston, Woorabinda and Theodore (Map 2), on sandstone gullies or on the sandy alluvials adjacent to sandstone ranges.

Phenology: Flowers have been collected in January and March, and fruits in January.

Notes: *B. brachypoda* is closely related to *B. collina*, but differs from that by the obovate leaves with obtuse apex, 3-flowered inflorescence (mostly 7-flowered for *B. collina*), fimbriate petal margins and stipes 1.2–2.5 mm long (2.5–4 mm long for *B. collina*). No intergrades with any other species are known.

Conservation status: This taxon is not considered rare or threatened.

Etymology: The species epithet is derived from the Greek “brachy-” short and “-podus” footed, based; in reference to the short flower stipes of this species.

8. *Babingtonia papillosa* A.R.Bean sp. nov.
affinis *B. tozerensi* A.R.Bean a qua

foliis plerumque angustioribus, pedicellis brevioribus, et petalis fructibusque minoribus differt. **Typus:** Queensland. NORTH KENNEDY DISTRICT: Ridge near headwaters of Cockatoo Creek, Mt Elliot National Park, south of Townsville, 4 January 1997, *A.R. Bean* 11563 & *P.G. Bean* (holo: BRI; iso: A, K, MEL, NSW, QRS).

Babingtonia sp. (Townsville A.R. Bean 3424) in Henderson (1997).

Shrub to 1.5 m high. Bark grey, persistent, scaly to fibrous. Branchlets quadrangular with flat sides, not flanged, white to grey, margins entire; oil glands present, papillose. Leaves petiolate; petiole c. 1.0 mm long; lamina obovate, 8.0–11.5 mm long, 2.2–3.8 mm wide, concolorous, straight, flat, not keeled, oil glands prominent, especially on lower surface, c. 0.5 mm apart, midrib faintly visible on abaxial surface, invisible on adaxial surface, intramarginal vein not visible, apex obtuse or acute. Inflorescence axillary, 7(–9)-flowered; peduncles 10–12.5 mm long; stipes 2.0–3.5 mm long; bracts 2, caducous, deltate, 0.6–0.8 mm long, acute; bracteoles similar but somewhat smaller. Hypanthium smooth, glandular, broadly campanulate, 1.8–2.2 mm long, fused to the ovary except at top; calyx lobes simple, semi-elliptic, c. 0.6 × 1.8 mm, thin, margins entire. Corolla up to 9 mm across; petals orbicular, 2.5–3.0 × 2.5–3.0 mm, white, oil glands present, margins entire. Stamens 11–14, in groups of 1–4 opposite the calyx lobes, stamen opposite to centre of calyx lobe shorter than remainder; filaments terete, 0.7–1.0 mm long, geniculate, with brown connective gland fused to upper part of filament at the bend; anthers adnate, dehiscing by short divergent slits, with loculi free. Style terete, up to 1.2 mm long after anthesis, set into a pit; stigma broadly capitate. Ovary 3-locular; floral disc shallowly concave; ovules 18–20 per loculus, arranged radially around placenta. Fruit hemispherical, c. 1.5 × 3.0 mm, valves broad, somewhat woody, slightly exserted. Seeds discoid, c. 0.8 mm long, brown, with flat sides and rounded backs, finely reticulate (Fig. 1 I, J).

Specimens examined: Queensland. NORTH KENNEDY DISTRICT: Cockatoo Creek area, Mount Elliot, S of

Townsville, Aug 1991, *Bean* 3589 (BRI, NSW, PERTH); Cape Cleveland section, Bowling Green Bay N.P., S of Townsville, Jul 1991, *Bean* 3424 (BRI).

Distribution and habitat: *B. papillosa* occurs only in the Bowling Green Bay National Park south of Townsville. This National Park includes Mt Elliot and Cape Cleveland, where the two known populations are located (Map 1). The species is confined to shrubland on outcrops of granite-like rocks, on skeletal soil, and is associated with shrubs such as *Leptospermum brachyandrum* (F.Muell.) Druce.

Phenology: Flowers have been recorded in January; fruits from February to July.

Affinities: *B. papillosa* is very closely related to *B. tozerensis*, but differs from that by its flower stipes 2–3.5 mm long (3.5–5 mm for *B. tozerensis*), petals 2.5–3 mm in diameter (3–3.5 mm for *B. tozerensis*), fruits 1.5 mm long and 3 mm in diameter (2 mm long, 4 mm diameter for *B. tozerensis*) and the mostly narrower leaves (2.2–3.8 mm wide, compared to 3.0–6.5 mm for *B. tozerensis*). No intergrades with any other species are known.

Conservation status: The risk category for *Babingtonia papillosa*, according to the criteria of Chalson and Keith (1995) is “critical” (criterion a). The species is known from just two populations. There are 20 known plants at the type locality, and 3 known plants at Cape Cleveland. The species is under threat due to its small population size and specialised habitat.

The recommended conservation status for this species as defined by the Queensland Nature Conservation Act 1992 is ‘endangered’.

Etymology: The specific epithet is from the Latin *papillosus*, meaning “covered with papillae or small wart-like structures”, and refers to the raised oil glands present on the young branchlets.

Dubious name

Baeckea virgata var. *polyandra* Maiden & E.Betche, Proc. Linn. Soc. New South Wales 23: 12 (1898). Type citation: “Forms dense bushes 6–8 ft. high on the banks of the Snowy River at Jindabyne (J.H. Maiden, January 1898)”.

No type has been located for this name, but from the description given in the protologue, this taxon is not related to *Babingtonia virgata*, but may be referable to *Kunzea ericoides*.

Acknowledgements

I thank the Directors of A, BM, G, GH, K, MEL, NE, NSW, HO, P, and WELTU for the loan of specimens and/or access to their herbaria; Lloyd Bird and Kym Sparshott for making collections of *Babingtonia*; Lyn Craven (CANB) for the Latin diagnoses; Mr John Williams and Mrs Peggy Rowland for showing me *B. crassa* and *B. brachypoda* respectively. John Dawson (WELTU) kindly sent me his English-language manuscript of New Caledonian *Baeckea*. Thanks are due to Paul Williams and Col Adams of N.P.W.S. Townsville for visiting the type population of *B. papillosa*, and to my brother Peter for accompanying me to collect flowers of that species.

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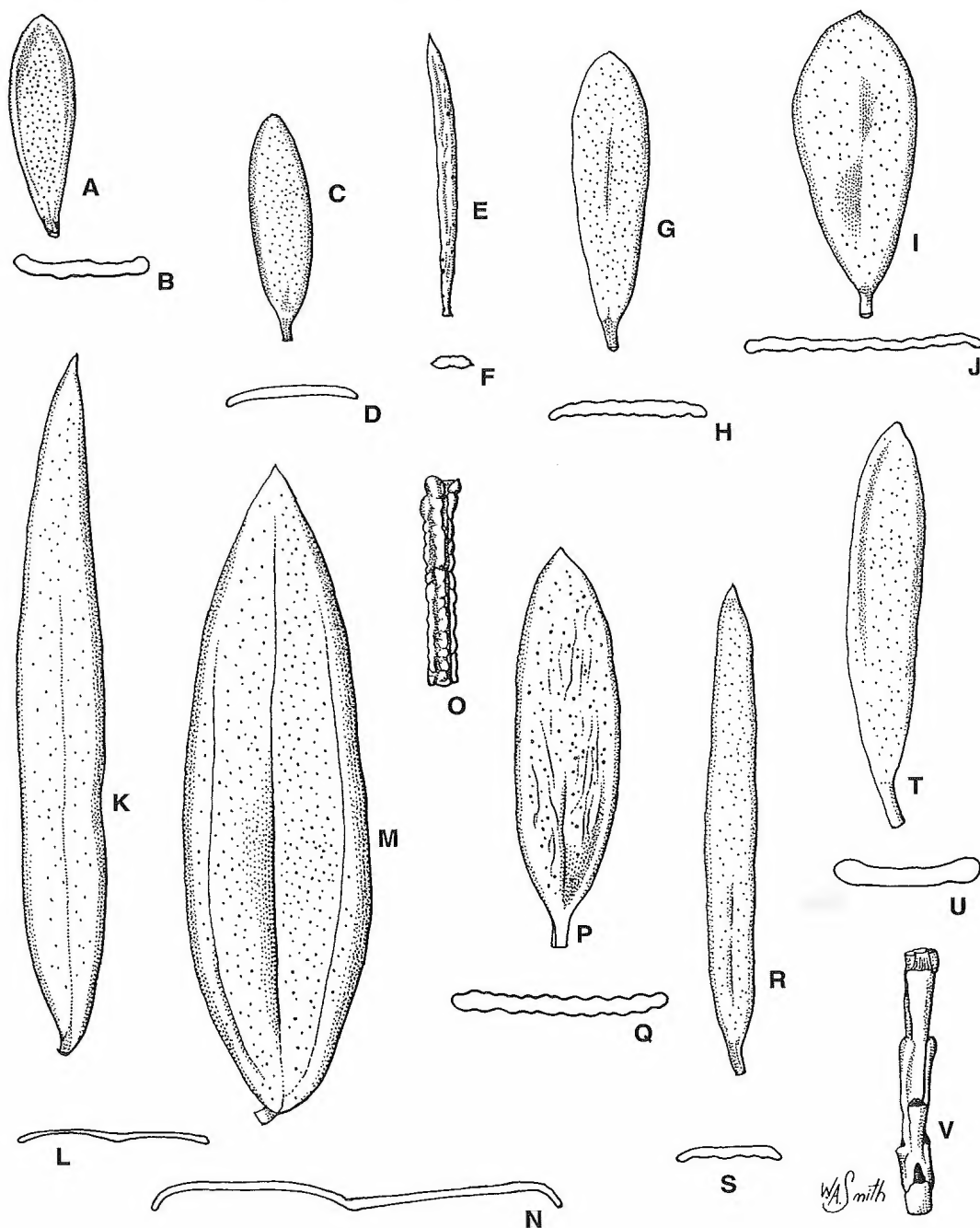


Fig. 1. *Babingtonia brachypoda* A. leaf $\times 5$. B. transverse section of leaf $\times 10$. *Babingtonia bidwillii* C. leaf $\times 5$. D. transverse section of leaf $\times 10$. *Babingtonia angusta* E. leaf $\times 5$. F. transverse section of leaf $\times 10$. *Babingtonia collina* G. leaf $\times 5$. H. transverse section of leaf $\times 10$. *Babingtonia papillosa* I. leaf $\times 5$. J. transverse section of leaf $\times 10$. *Babingtonia pluriflora* K, M. leaves $\times 5$. L, N. transverse section of leaves $\times 10$. O. branchlet $\times 5$. *Babingtonia crassa* P. leaf $\times 5$. Q. transverse section of leaf $\times 10$. *Babingtonia similis* R. leaf $\times 5$. S. transverse section of leaf $\times 10$. *Babingtonia virgata* T. leaf $\times 5$. U. transverse section of leaf $\times 10$. V. branchlet $\times 5$. A, B from Bean 9543; C, D from Bean 6803; E, F from Bean 8321; G, H from Bird (AQ566671); I, J from Bean 3589; K, L, O from Melville 2726; M, N from Pullen 4618; P, Q from Bean 8289; R, S from Thorne 20481; T-V from McKee 37807.

Systematic and cladistic studies of *Myrtella* F. Muell. and *Lithomyrtus* F. Muell. (Myrtaceae)

Neil Snow and Gordon P. Guymer

Summary

Snow, N. & Guymer, G.P. (1999). Systematic and cladistic studies of *Myrtella* F. Muell. and *Lithomyrtus* F. Muell. (Myrtaceae). *Austrobaileya* 5(2): 173-207. A systematic revision of species formerly placed in *Myrtella* F. Muell. (Myrtaceae) is presented. Species primarily from New Guinea remain in *Myrtella* sensu stricto (*M. beccarii*, *M. bennigseniana*) whereas all species from Australia are transferred to the genus *Lithomyrtus* F. Muell. *Lithomyrtus* includes seven new species viz *L. densifolia* N. Snow & Guymer, *L. dunlopiae* N. Snow & Guymer, *L. grandifolia* N. Snow & Guymer, *L. hypoleuca* N. Snow & Guymer, *L. kakaduensis* N. Snow & Guymer, *L. linariifolia* N. Snow & Guymer and *L. repens* N. Snow & Guymer. Four new combinations viz *L. cordata* (A.J. Scott) N. Snow & Guymer, *L. microphylla* (Benth.) N. Snow & Guymer, *L. obtusa* (Endl.) N. Snow & Guymer and *L. retusa* (Endl.) N. Snow & Guymer are made for other species belonging to *Lithomyrtus*. *Myrtella phebalioides* (W. Fitzg.) A.J. Scott is reduced to synonymy under *L. retusa*, and *M. rostrata* Lauterb. is transferred to *Uromyrtus* as *U. rostrata* (Lauterb.) N. Snow & Guymer. Character data and preliminary cladistic studies strongly support the generic separation of *Lithomyrtus* from *Myrtella*, but all clades within *Lithomyrtus* in the strict consensus tree are highly unstable. Iterative studies with additional outgroups are needed to more confidently infer generic and specific relationships in *Lithomyrtus*, *Myrtella* and related genera.

Keywords: *Myrtella*, *Lithomyrtus*, *Fenzlia*, *Uromyrtus*, Myrtaceae, Myrtoideae, systematics, cladistics, Australia, New Guinea.

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Introduction

The family Myrtaceae Juss. is particularly rich in South America and Australasia (Cronquist 1981; Johnson & Briggs 1985; Wilson 1996; Mabberley 1997), with new taxa being described yearly (Sobral 1994; Bean & Brooker 1995; Lyne & Crisp 1996). Although some genera have been revised recently (e.g., Landrum 1981, 1988; Ladiges & Humphries 1983; Thiele & Ladiges 1988; Grifo 1992; Hill & Johnson 1995; Toelken 1996; Chappill & Ladiges 1996; Bean 1997a, b), many remain poorly studied. Other biological aspects of Myrtaceae have recently been investigated from various perspectives (Beardsell et al. 1993; Krauss 1994; Costa et al. 1995; Nic Lughadha & Proença 1996; Byrne et al. 1996; Gadek et al. 1996; Landrum & Bonilla 1996; Haron & Moore 1996; Orlovich et al. 1996; Shapcott & Playford 1996; Sale et al. 1996).

Taxa previously placed in *Myrtella* F. Muell. sensu lato were reviewed most recently by Scott (1978). For some time, Australian botanists have been aware of undescribed species in the Northern Territory, particularly in the sandstone escarpment regions of Kakadu National Park and neighbouring areas that relate to this genus. In this paper, we cladistically test the hypothesised monophyly of the predominantly New Guinean taxa (included in *Myrtella* s.s. herein) and the exclusively Australian taxa (included in *Lithomyrtus* F. Muell. herein), describe seven new species in *Lithomyrtus*, provide the first comprehensive revisions of both genera and transfer *Myrtella rostrata* Lauterb. to *Uromyrtus* Burret.

Taxonomic history

Species herein assigned to *Myrtella* and *Lithomyrtus* traditionally have been treated as congeneric under *Myrtella* (Scott 1978). This

account is the first to accept *Lithomyrtus* for Australian species traditionally assigned to *Myrtella*. As detailed below, this generic segregation is strongly supported by cladistic studies.

The name *Myrtella* has been associated with *Fenzlia* which Endlicher (1834) published with the detailed description and illustration of two Australian species (*F. obtusa* and *F. retusa*). As correctly noted by Scott (1978), *Fenzlia* Endl. is an illegitimate later homonym of *Fenzlia* Benth. (Polemoniaceae). Mueller (1877) published *Myrtella* for two new species from New Guinea based primarily on their “nearly valvular preflorance of the calyx”, although he was unable to suggest tribal affinities of this genus due to the absence of fruits. One of Mueller’s two initially described species, *Myrtella hirsutula* F.Muell. was recently transferred to *Kania* Schlechter by Scott (1990).

Bentham (1866) described *Fenzlia obtusa* var. *microphylla* as new based on its leaf size, and placed *Fenzlia* in his tribe Myrteae which he characterized as having an ovary divided into two or more cells (rarely 1-celled) with parietal placentation and the fruit having a berry or drupe (but see discussion of characters, Appendix 1). Bentham and Hooker (1867) largely followed the more detailed account of Bentham (1866). Niedenzu (1893) was the first to correctly identify the testa layer as the hard portion of the fruit, which earlier had been designated incorrectly as endocarp.

Burret (1941) merged *Myrtella* with *Fenzlia*, and partitioned the species then known into sections *M. sect. Myrtella* F.Muell. and *M. sect. Eufenzlia* Burret. He contradicted himself by saying initially the genera always look very different (“... sehen habituell recht verschieden aus”) but later indicated he was unable to find any substantial differences between them (“Wesentliche Unterschiede zwischen beiden Gattungen finde ich nicht”). The latter statement is also at odds with the characters he used to recognise the sections.

Lithomyrtus was described by Mueller (1857: 228) as a “new genus, *Lithomyrtus*,

MSS.,” which he distinguished from *Psidium* L. by its “dry berry and a circinate embryo”. Although no particular species was included in it at that time, Mueller’s diagnosis of *Lithomyrtus* constitutes valid publication of the name (see ICBN Articles 32.1 and 41.2). Later, Mueller (1858: 156) again made reference to *Lithomyrtus*, but although labels on some of his specimens bear the name *L. hypoleuca* (DBL and K, photos at BRI), this combination was never published (Muir 1978). Later still, Mueller (1882) apparently abandoned *Lithomyrtus*, since he excluded it from the synonymy for native genera of Australian plants. It is not clear to which genus Mueller then intended to assign specimens he annotated as *Lithomyrtus hypoleuca* (see above). He may have considered *L. hypoleuca* conspecific with *L. obtusa*.

In the most recent synopsis of the genus *Myrtella* Scott (1978) recognized sections *M. sect. Myrtella* (4 spp.) and *M. sect. Fenzlia* (5 spp.), and described as new the Australian species *M. cordata*. Briggs & Johnson (1979) and Johnson & Briggs (1985), however, maintained *Myrtella* as generically distinct from *Lithomyrtus* (as *Fenzlia*).

Materials and methods

Taxonomic descriptions: Taxon boundaries (Snow 1997) and character data for *Lithomyrtus* were determined from herbarium specimens and fresh and preserved material collected in the field; for *Myrtella* only herbarium specimens were used. The list of characters (Appendix 1) and natural language descriptions were generated using the DELTA program of Dallwitz et al. (1993). Embryos were absent in all fruits of *Lithomyrtus linariifolia* and *L. hypoleuca* examined. Terminology for tissue layers of fruits and seeds follows Esau (1960). Conservation status evaluations are made according to IUCN categories (Species Survival Commission 1994).

Cladistic analysis: Phylogenetic relationships of *Myrtella* and *Lithomyrtus* were inferred using PAUP Vers. 3.1.1 (Swofford 1993) with the branch and bound algorithm (Hendy & Penny, 1982) with the following options –

keep minimal trees only, collapse zero length branches, additional sequence furthest, and MULPARS. All characters were unordered and unweighted (Appendix 2; Table 1). A test for phylogenetic signal was assessed using the *g*₁ statistic with 10,000 random trees (Huelsenbeck 1991). A successive weighting procedure based on the rescaled consistency index (Naylor & Kraus 1995) was implemented following the unweighted analysis. Candidate outgroups were not obvious since many genera of Australasian Myrtoideae have been poorly studied and generic relationships among them untested. We thus designated *Myrtella* as the outgroup and rooted the trees to make *Lithomyrtus* a sister clade to *Myrtella*. The stability of clades in the strict consensus tree was evaluated using minimal character support values (Davis 1993).

Results and discussion of cladistic analysis

Unweighted analysis: The *g*₁ value of -2.82 indicates considerable left-hand skewness suggesting greater phylogenetic signal than expected at random (Huelsenbeck 1991). The unweighted analysis resulted in four most-parsimonious trees (MPTs) of 70 steps (after rooting: *ci* = 0.857; *ri* = 0.744, *rc* = 0.637). The one fully-resolved MPT and the strict consensus tree are illustrated in Figures 1 & 2.

In all MPT's, the two species of *Myrtella* s.s. formed a clade basal to *Lithomyrtus* giving cladistic support to the hypothesis that these genera are distinct (Fig. 1). Thirteen uncontested synapomorphies support the distinctness of *Lithomyrtus* from *Myrtella* (2, 3, 8, 10, 13, 14, 16, 19, 22–26). Although some of these characters may break down in Myrtaceae when viewed collectively this analysis strongly supports segregation of *Lithomyrtus* from *Myrtella*.

The exceptionally strong support for the separation of *Myrtella* from *Lithomyrtus* contrasts markedly with the weak support for separation of clades within *Lithomyrtus*. Since each clade within *Lithomyrtus* in the strict consensus tree can be collapsed by the removal of a single character (Davis 1993), little weight should be accorded to those clades until

congruency testing with additional characters suggests better support (Patterson 1982).

Successively weighted analysis: Successive weighting based on the rescaled consistency index converged on two MPT's after only one iteration. The strict consensus tree based on successive weighting (Fig. 3) had only two additional nodes resolved relative to the unweighted strict tree, so this procedure was of minimal help in inferring uncontested patterns of descent. However, the tree very closely resembled the one fully-resolved tree from the unweighted analysis.

The choice of root can strongly influence character polarity and the recognition of monophyletic groups (e.g., Scotland 1992). Since generic relationships in Myrtaceae remain poorly known and most untested cladistically, further analyses with additional outgroup genera will be necessary before reliable inferences can be made regarding relationships between *Lithomyrtus*, *Myrtella* and related genera. In particular, the monotypic *Myrtastrum* Burret (New Caledonia) and *Neomyrtus* Burret (New Zealand), which resemble *Myrtella* in gross morphology, may be closely related and thus are candidate genera. However, given the geographic proximity of *Myrtella* (mostly New Guinea) and *Lithomyrtus* (exclusively Australian) and the fact that many myrtaceous genera (e.g., *Austromyrtus* s.l., *Melaleuca*, *Asteromyrtus*, *Eucalyptus*) range across these areas, it was not unreasonable to use *Myrtella* to root a cladistic analysis of *Lithomyrtus* for a first approximation of species relationships.

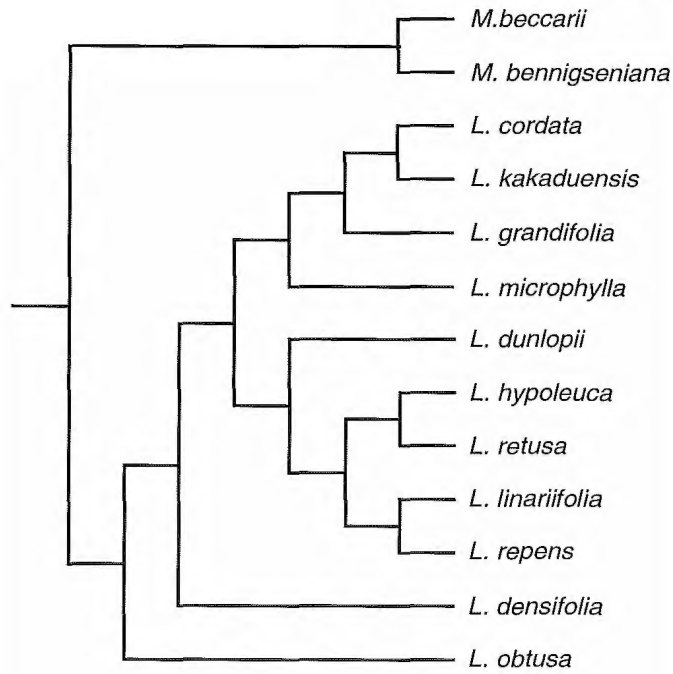


Figure 1. One of four most parsimonious trees resulting from branch and bound search using unweighted and unordered characters, with *Myrtella* designated as outgroup a priori.

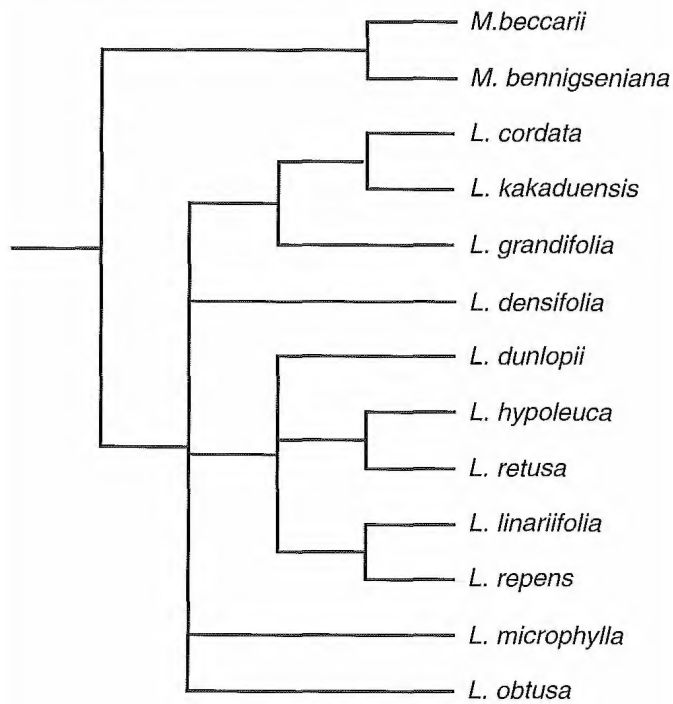


Figure 2. Strict consensus tree.

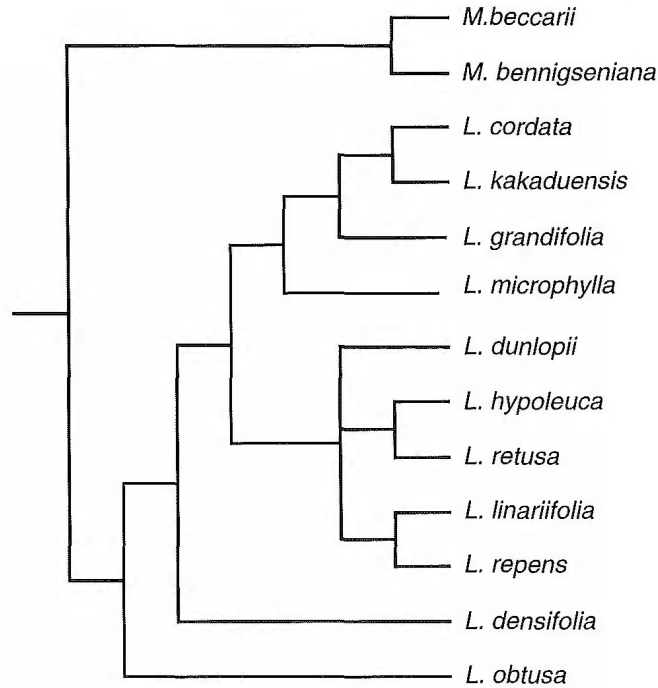


Figure 3. Strict consensus tree based on successive weighting with the rescaled consistency index.

Taxonomic treatment

Key to Genera

Branchlets distinctly 4-angled, edges of younger stems winged, the wing apices flaring outward; leaves mostly glabrous above and below (but often sericeous on lower portions of midvein); stipules very short, thick, dark red, scale-like, often fused laterally; apex of youngest leaves distinctly comose; bracteoles glabrous (or minutely hairy on edges), leaf-like and usually with a midvein, somewhat falcate and flexuous, usually persistent in fruit; sepals valvate in bud; stamens uni- or multiseriate; fruits globular, less than 5 mm long, glabrous, red to nearly black; staminal disk glabrous; style glabrous; ovary 2 or 3 (or 4)-locular; ovules 2–4 per locule; embryo relatively thick, slightly curved or crescent-shaped; embryo not spirally contorted, thickened towards tip; cotyledons straight, thick, very short. Indonesia (Irian Jaya), Papua New Guinea, Guam; reported also from Mariana and Caroline Islands **Myrtella**

Branchlets rounded, younger twigs rounded; leaves mostly somewhat hairy above, often villous to tomentose below; stipules consisting of two to several free ferrugineous setose hairs; apex of youngest leaves not distinctly comose; bracteoles hairy (or at least glabrescent), scale-like and lacking a midvein, straight or slightly curved, usually absent in fruit; sepals imbricate in bud; stamens multiseriate; fruits globular to cylindrical or fusiform, mostly greater than 5 mm long, glabrescent to densely tomentose, yellow-to olive-green or whitish by virtue of dense hairs; staminal disk hairy; style

often sericeous, especially near base; ovary 1-locular; ovules (1–) 2 (or 3) per locule; embryo relatively thin; circinate; embryo sometimes spirally contorted, slightly thickened towards tip; cotyledons circinate, thin, relatively long. Tropical Australia **Lithomyrtus**

Myrtella F.Muell., Descr. Notes on Papuan Plants 1: 105 (1877). **Type:** *Myrtella beccarii* F.Muell. (lecto: fide Scott 1978).

Saffordiella Merrill, Philipp J. Sc. 9: 124 (1914). **Type:** *Saffordiella bennigseniana* (Volk.) Merrill.

Shrubs or small trees, 0.3–6.0 m tall. Bark smooth or stringy, brown or grey. Branchlets distinctly four-angled, the edges distinctly winged, glabrous or sparsely sericeous to villous near apex of internodal wings, oil glands visible and prominent, or lacking. Leaves decussate, opposite, evenly distributed or mostly concentrated near branch tips, coriaceous. Stipules consisting of 2–several short, thick, dark red, often laterally fused scale-like structures. Petioles 0.5–1.0 mm long, not channelled, eglandular. Leaf blades narrowly elliptic to narrowly ovate, margins usually slightly revolute, bases truncate, not clasping the stem, apex obtuse, upper surface mostly glabrous but sericeous on lower portion of midvein (young leaves apically comose), adaxial midvein impressed or not, lower surface glabrous or sericeous on lower portion of midvein, glands of lower surface visible and about the same size, marginal veins of lower surface invisible or indistinct. Inflorescence a solitary axillary flower. Peduncles rigid, glabrous. Bracteoles foliaceous, midrib usually present, irregularly flexuous, the tips (in flower) exceeding base of sepal lobes, glabrous, mostly persistent in fruit. Hypanthium obconic,

glabrous. Sepals 5, fused below. Sepal lobes valvate in bud, apex acute, glabrous to sparsely short tomentose along edges, persistent in fruit, more or less ascending and mostly held above fruit. Petals 5, white to pink, elliptic to ovate, upper surface glabrous, lower surface glabrous to minutely tomentose on edges. Stamens 15–50, uni- or multiseriate, included, folded centrewards in bud. Staminal disk glabrous. Anthers subglobose, dorsifixed, versatile, less than $\frac{1}{4}$ length of filaments, dehiscence by longitudinal slits, connective glandular or eglandular. Ovary 2 or 3 (or 4)-locular, ovules 2–4 per locule, placentation parietal. Style 1, flexuous, or mostly straight, glabrous. Stigma 1, terete or scarcely (if at all) capitate. Fruit indehiscent, a hard berry with bony, more or less fused seeds, subglobose to globose, the base somewhat tapered, glabrous, red or dark blue to brown or nearly black (when dried). Seed coat hard, bony. Adjacent seeds slightly fused, their boundaries in longitudinal section generally distinct and perpendicular to long axis of fruit. Embryo slightly curved to crescent-shaped. Radicle relatively short, relatively thin, swollen near tip, the tip not spirally contorted (held at same horizontal plane as embryo). Cotyledons straight, relatively short; shorter than hypocotyl, relatively thick, not folded back towards hypocotyl.

Papua New Guinea, Irian Jaya, Guam; reported but not verified from Caroline Islands and Mariana Islands (Diels 1921).

Key to species of *Myrtella*

- Leaves greater than 9 mm long; internodes of branchlets mostly longer than 0.4 cm; wings of young twigs hairy only near apex; stamens multiseriate 1. **M. beccarii**
- Leaves less than 6 mm long; internodes of branchlets mostly shorter than 0.3 cm; wings of young twigs hairy throughout; stamens uniseriate 2. **M. bennigseniana**

- 1. *Myrtella beccarii* F.Muell., Descriptive Notes on Papuan Plants 106 (1877).
Type: Indonesia. Irian Jaya. Baia de Humboldt, XII/1875, *Beccarii* 37777 (lecto: here designated FI).**

Shrubs or small trees, 0.5–5 m tall. Bark smooth or stringy, brown. Branchlets glabrous to sparsely sericeous near apex of internodal wings, oil glands prominent. Leaves more or less evenly distributed. Petioles 0.5–1 mm long, rounded, eglandular. Leaf blades narrowly elliptic to elliptic, 7–11(–13) mm long, 2–3.5(–5) mm wide, base truncate, apex obtuse, margins revolute, upper surface glabrous except for sericeous lower portion of midvein and young leaves, adaxial midvein flush above, lower surface glabrous or sericeous on lower portion of midvein, marginal veins of lower surface absent or indistinct. Peduncles 3–4 mm long in flower. Bracteoles 3–3.5 mm long, 0.6–0.8 mm wide, glabrous. Sepal lobes 2.5–3 mm long, sparsely short-tomentose along edges. Petals white, ovate, 4 mm long; the lower surface minutely tomentose on edges. Stamens uniseriate or biseriate, c. 2.5 mm long; anther connectives eglandular. Style 2.5–4 mm long, flexuous or mostly straight. Fruit subglobose, sometimes abruptly tapered to base, 2.5–4.5 mm long, 2.5–3.5 mm wide, green, turning red to dark brown or nearly black at maturity. Fig. 4 A–H.

Specimens examined: Papua New Guinea. MOROBE DISTRICT: LAE SUBDISTRICT: Lasagna Island, 7°25'S, 147°15'E, Nov 1969, *Streimann* NGF44305 (BRI, L); Buso Village, 7°25'S, 147°10'E, Nov 1969, *Streimann* NGF44151 (BRI, L); Buso River, *Foreman* LAE52292 (L); Buso River, SE of Lae on the coast, opposite Lasagna Island, 7°25'S, 147°10'E, Nov 1973, *Jacobs* 9650 (L); Buso River in lower land beside the river, Jun 1980, *Rau* 603 (L); 8 km S of Salamaua, Sep 1973, *Paijmans* 1564 (L); Buso, 7°25'S, 147°10'E, Nov 1979, *Henty* LAE72469 (CANB, L, QRS); Koneipa Village, Kipu, 7°50'S, 147°10'E, Jan 1966, *Streimann & Kairo* NGF26129 (BRI, L); Buso, S of Lal, Jun 1978, *Bellamy* B6 (L). MOROBE SUBDISTRICT: Paiawa Valley, along lower reaches of Paiawa River, 7°35'S, 147°15'E, May 1970, *Johns* NGF47319 (BRI); Buso (Morobe), S of Lae, Jun 1970, *Bellamy* s.n. (CANB, L); Creek at end of logging road near Paiawa River, SPT, 7°30', 147°15'E, Oct 1965, *Gillison* NGF25026 (CANB, L); Payawa Village, 7°35'S, 147°10'E, Jun 1981, *Katik* LAE74928 (L). NORTHERN DISTRICT: Ca 2 miles S of Toma, Bariji-Managalese area, Sep 1964, *Pullen* 5919 (BRI, L). WEST NEW BRITAIN DISTRICT: HOSKINS SUBDISTRICT: NNE slope Mt Ulawon, 5°02'S, 15°22'E, Feb, 1971, *Stevens* LAE51251 (BRI, CANB, L). DISTRICT UNKNOWN: Korepa, 7°55'S,

147°05'E, *Kairo* 47 (CANB). **Indonesia.** IRIAN JAYA: DISTRICT HOLLANDIA: Cycloop Mts, along path to Neta, Jun 1938, *Mayer Dress* 138 (L); Cycloop Mts, foothills W of Koejaboe River and E of Hoebal River, *Royen* 4149 (L). DISTRICT RADJAH AMPATI: Weigo Island, E bank of Majalibit Bay, Jan 1955, *van Royen* 5217 (CANB, L); Town of Sukarnapura, *Koatermanns & Soegong* 560 (L); Waigeo Island, Kabaré Bay, Jan 1955, *van Royen* 5361 (L).

Distribution and habitat: Papua New Guinea, Indonesia (Irian Jaya); reported but not verified from Solomon Islands and Micronesia (Scott 1990). Growing in a wide range of habitats, predominantly in moist rocky and disturbed areas but also near beaches, in forests of *Weinmannia* or *Casuarina*, and in xerophytic vegetation on ultrabasic soils (*van Royen* 5361), at altitudes from near sea level to 2500 metres.

Phenology: Flowering January to November; fruiting mostly April to November.

Notes: The flowers of *M. beccarii* are white, and the stamens are reported to be pale green or cream coloured. The bright red fruit dries to a much darker red colour. Due to the wide elevational range, additional or cryptic taxa may exist within it as currently accepted.

Conservation status: Herbarium labels often report the species as locally common or abundant.

Local names: zagiebara (Middle Waria, *Streimann & Kairo* NGF26129 [BRI, L]).

- 2. *Myrtella bennigseniana* (Volk.) Diels in Engl. Bot. Jahrb. 56: 529 (1921); *Leptospermum bennigsenianum* Volk. in Engl. Bot. Jahrb. 31: 407 (1902); *Saffordiella bennigseniana* (Volk.) Merrill, Philipp. J. Sci. 9: 124 (1914); *Fenzlia bennigseniana* (Volk.) Burret, Notizb. Bot. Gart. Berlin 15: 500 (1941).
Type: Caroline Islands, *Volkens* 277 (lecto: CAL, here designated) (type material at B destroyed, fide Hiepko 1987).**

Shrubs or small trees, 0.3–6.0 m tall. Bark smooth, brown or grey. Branchlets sparsely sericeous to villous, sometimes densely so, oil glands absent. Leaves concentrated near branch tips or mostly evenly distributed. Petioles 0.5–1 mm long, rounded, eglandular. Leaf blades



Figure 4. A–H: *Myrtella beccarii*. A. flowering branchlet $\times 3$. B. section of branchlet $\times 8$. C. adaxial leaf profile $\times 4$. D. adaxial leaf apex $\times 8$. E. flower $\times 4$. F. bracteole $\times 8$. G. fruit $\times 4$. H. flower bud $\times 3$. A, C, D, H: *Henry* LAE72969 (L). B: *Streimann* NGF44151 (BRI). E, F, G: *Bellamy* B6 (L). I–O: *M. bennigseniana*. I. flowering branchlets $\times 3$. J. section of branchlet $\times 8$. K. abaxial leaf profile $\times 4$. L. adaxial leaf apex $\times 8$. M. flower $\times 6$. N. bracteole $\times 12$. O. fruit $\times 12$. I–O: *Rinehart* 12019 (BRI). P–W: *Lithomyrtus cordata*. P. flowering branchlet $\times 1.5$. Q. section of branchlet $\times 16$. R. abaxial leaf profile $\times 1$. S. adaxial leaf apex (hairs not shown) $\times 2$. T. flower with front petals removed $\times 3$. U. bracteole $\times 8$. V. fruit $\times 2$. W. flower bud $\times 3$. P–W: *Snow* 7420 et al. (BRI).

elliptic to narrowly ovate, 3.5–5(–7) mm long, 2–2.5 mm wide, base truncate, free from the stem, apex obtuse, margins revolute, upper surface glabrous except for sericeous lower portion of midvein and young leaves, midvein impressed above, lower surface glabrous or sericeous on lower portion of midvein. Peduncles 2–5 mm long in flower. Bracteoles 2–3.5 mm long, 0.4–0.6 mm wide, glabrous or minutely and sparsely sericeous along edges. Sepal lobes 1.5–2 mm long, glabrous or sparsely short tomentose along edges. Petals white to pink, elliptic to ovate, 2–3 mm long; lower surface glabrous. Stamens uniseriate, c. 1.5 mm long; anther connectives glandular. Style 1.5–3 mm long, flexuous. Fruit globose, tapered at base, 1.5–3 mm long, 2.5–3 mm wide, brown to dark bluish-black when mature. Fig. 4I–O.

Specimens examined: Guam. Savanna in Siqua Falls area, between Alutom & Tenjo ridges, Jan 1986, *Rinehart* LR12019 (BRI); Savanna along road (and pipeline) to OMNI on north spur from Fonte Plateau (Nimitz Hill), Sep 1985, *Rinehart* LR11544 (BRI); Savanna in Siqua Falls area, between Alutom and Tenjo ridges, Jan 1986, *Rinehart* LR12019 (BRI). Indonesia. IRIAN JAYA: Tablasoefoe, E of Village, Aug 1961, *van Royen & Sleumer* 6449 (BRI); Cycloop Mountains, southern slope of Makanoi Range, N of Kotanica, Jul 1961, *van Royen & Sleumer* 6211 (BRI); Cycloop Mountains, Arthur Hill, E slope, Jul 1961, *van Royen & Sleumer* 6161 (BRI); Hollandia [= Jayapura] and vicinity, Jun–Jul 1938, *Brass* 8887 (BRI); Jayapura, Böschung der Küstenstrasse im nordöstlichen Teil der Stadt, Feb 1976, *Hiepko & Shultze-Motel* 579 (L); Kota Nica, Hollandia, Oct 1956, *Schram* BW2844 (L); Town of Sukarnapura (= Hollandia), *Kostermanns & Soegeng* 560 (L); Cape Tanah Merah, Aug 1961, *van Royen & Sleumer* 6501 (L); “Base G”, Hollandia, Dec 1956, *Sidje* BW4126 (CANB, L); Cycloop Mts, along path to Near, *Meyer Dress* 138 (L); Cycloop Mts, foothills W of Koejaboe River and E of Hoebal River, *van Royen* 4149 (L); Jayapura, , Böschung der Küstenstrasse im nordöstlichen Teil der Stadt, Feb 1976, *Hiepko & Shultze-Motel* 509 (L). Papua New Guinea. Sewa Bay, Normanby Island, April 1956, *Womersley* NGF8687 (BRI); Normanby Island, Mt Pabinama, May 1956, *Brass* 25703 (L); Province Milne Bay, Subprovince Esa’ala, NE of Bwasiaiai, Dec 1977, *Croft & Marsh* LAE71203 (L); Along Arumu River S of Botue village, Sep 1953, *Hoogland* 3963 (BRI, L).

Distribution and habitat: Indonesia, Papua New Guinea, Guam; also reported but not verified from Caroline and Mariana Islands. In open grasslands, occasionally in understorey of *Dacrydium* forests, on lateritic soils, between 20 and 2500 metres altitude.

Phenology: Flowering March to September; fruiting March to October.

Notes: The flowers of *M. bennigseniana* are white or pinkish. The reddish fruit dries to nearly black. The uniseriate, glandular stamens are reliable diagnostic attributes in flower as are the densely pubescent young twigs in sterile material. Reports of the species from the Caroline Islands (Merrill 1914; Diels 1922) and Mariana Islands (Diels 1921, 1922) have not been confirmed. The wide elevational range suggests the possibility of more than one taxon within this species as currently accepted.

Conservation status: The relative few collections of this species and dearth of detailed information on specimen labels indicate the species is data deficient.

Local name: ètèti (Orokaiva language, Mumuni; see *Hoogland* 3963 [BRI, L]).

Excluded species

Uromyrtus rostrata (Lauterb.) N.Snow & Guymer, **comb. nov.**

Myrtella rostrata Lauterb., Nova Guinea 8: 855(1912). **Type:** New Guinea. Hellwig Mountains, *Roemer* 1050 (holo: L, photo BRI).

The type specimen of *Myrtella rostrata* has the inflorescence, fruit and seed characters of *Uromyrtus* and is subsequently transferred to this genus.

Kania hirsutula (F.Muell.) A. J. Scott, Kew Bull. 45: 206 (1990); *Myrtella hirsutula* F.Muell., Descr. Notes Papuan Pl. 106 (1877); **Type:** Indonesia. Irian Jaya. Mount Arfak, Jul 1875, *Beccari* 3776 (lectotype, here designated: FI).

According to Article 37.3 of the International Code of Botanical Nomenclature (Greuter et al., 1994), sufficient information was provided by Mueller (1877) to indicate a holotype. However, given that Mueller loc. cit. did not cite a collection number of Beccari’s in the protologue and that Scott (1990) indicated no specimen can be found in the National Herbarium of Victoria, Melbourne on which Mueller might have based

his description, lectotypification here eliminates ambiguity surrounding the possible existence of a putative holotype implied by Scott's (1990) citation of an isotype. Scott loc. cit. provides irrefutable evidence for transferring *Myrtella hirsutula* to the genus *Kania*.

Lithomyrtus F.Muell., J. of Bot. and Kew Gard. Misc. 9: 228 (1857). **Type:** *Lithomyrtus hypoleuca* F.Muell. ex N.Snow & Guymmer, lecto: here designated.

Fenzlia Endl., Atakta Bot. 19. 1834, nom. illegit. non *Fenzlia* Benth., Bot. Reg. sub t. 1622. 1833. **Type:** *Fenzlia obtusa* Endl. (lecto: fide Scott 1978)

Frutices prostrati usque plerumque erecti vel raro arbusculae, folia juvenia et rami villosi usque tomentosi, saepe minus hirsuti vetustatibus. Stipulae parvae at prominentes, pilorum 2 aliquot ferrugineorum setosorum consistentes. Bracteolae non foliosae, absque costis distinctis. Flores solitarii in axillis foliorum. Sepala petalaeque pentamera, lobi sepalorum in alabastro seorsi, stamina multiseriata, numerosa. Fructus baccam vel baccatus. Ovarium maturitate plerumque solitarium. Semina plerumque 2 vel 3, oblique conferruminata, testa lignea. Embryo circinatus, cotyledones tenues, circinatae, apex radiculae incrassatus, ultra embryonem extendens.

Plants suffrutescent, shrubs or small trees, 0.2–5 m tall, stems prostrate, ascending or erect. Bark smooth or stringy, brown, grey to somewhat orange-coloured. Branchlets rounded, glabrous to tomentose, oil glands present and prominent or absent. Leaves decussate, opposite or rarely whorled at some nodes, evenly distributed or concentrated near growing tips, coriaceous to velvety. Stipules of 2–several free, ferruginous, setose hairs. Petioles channelled or rounded, eglandular or rarely glandular. Leaf blades linear to elliptic, ovate or sometimes obovate; margins flat or revolute; bases truncate, cordate or cuneate, occasionally clasping the stem; apex obtuse, retuse or acute, adaxial surface glabrous to tomentose with midvein impressed; lower surface glabrous to tomentose, marginal veins of lower surface prominent, indistinct or absent. Inflorescence a solitary axillary flower.

Peduncles rigid or sometimes flexuous, sparsely antrorsely sericeous to villous or tomentose. Bracteoles lacking a midrib, ascending, scale-like, slightly curved to straight, exceeding or shorter than base of sepal lobes, sparsely sericeous to densely villous or tomentose, persistent or caducous in fruit. Hypanthium obconic, densely sericeous to tomentose. Sepals 5, fused at the base. Sepal lobes imbricate in bud, apex acute to acuminate, sparsely sericeous to tomentose, persistent in fruit, held above or reflexed towards fruit. Petals 5, white, pink or magenta, elliptic to ovate or obovate. Stamens numerous, multiseriate, included, folded centripetally in bud. Staminal disk hairy. Anthers subglobose, dorsifixed, versatile, less than $\frac{1}{4}$ length of filaments, dehiscing by longitudinal slits, connectives glandular or eglandular. Ovary 1-locular, ovules (1 or) 2 (or 3) per locule, placentation parietal. Style 1, flexuous or mostly straight, glabrous or sparsely sericeous. Stigma 1, terete, rarely capitate. Fruit a hard berry with bony, tightly fused seeds, subglobose to cylindrical or sometimes fusiform, base rounded or tapered, glabrous to tomentose, light yellow or olive-green, or whitish by dense pubescence. Seed coat hard, bony. Adjacent seeds tightly fused, their boundaries in longitudinal section generally indistinct and often somewhat oblique to the long axis of fruit. Embryo circinate. Radicle relatively long, relatively thin, swollen near tip, the tip held at same horizontal plane as embryo or spirally contorted above or below. Cotyledons circinate, relatively long, shorter than hypocotyl, relatively thin, not folded back towards hypocotyl. Tropical Australia (Western Australia, Northern Territory, Queensland).

All Australian species formerly in *Myrtella* are now assigned to *Lithomyrtus*, which is confined to the North Australian Province of the Northeast Australian Region (Takhtajan 1986).

Notes: Leaves of *L. retusa* seedlings under a metre tall are generally longer than those of mature plants (Snow, pers. obs.) and the possibility of heteromorphy between juvenile and adult leaves needs further investigation. The black hair-like structures occasionally occurring on the foliage of some species (particularly *L.*

obtusa) are actually an ophiostimoid fungus (J. Simpson, pers. comm.).

The outer layers (perisperm) of the mature fruit of this genus typically disintegrate, leaving as a single diaspore the hard, fused seeds. The individual seed coats often have openings (opercula) from which the radicles probably emerge during germination of the seed.

Most plants with mature fruit of all *Lithomyrtus* species show evidence of some insect predation. A preliminary identification of insect casings and pupae found on their leaves and fruits shows these insects represent two families (P. Gullan, pers. comm.). The first of these families, Diaspididae (armoured scale insects), consist of insects phytophagous on a variety of plant parts, including fruits. The second, family Tachinidae (tachinid flies), comprises mostly parasites of other insects. Whether either insect is actually attacking the fruits of this genus

however, is unknown. A single moth pupa was found embedded in a fruit of *L. hypoleuca* but it was insufficiently mature for identification to family level (J. Lawrence, pers. comm.). Investigation of fruit predation therefore would appear to be a worthwhile field study, particularly in the Kakadu region of the Northern Territory where several *Lithomyrtus* species coexist.

The ornamental potential of the genus is well known (Hubbard 1978) and evaluations of this aspect is currently in progress at the Darwin Botanical Garden (G. Leach, pers. comm.). Potential horticultural disadvantages observed in the field include insect and fungal attack on *L. grandifolia* and ophiostemoid fungal infection occasionally noted on other species, most notably *L. obtusa*. Attempts to germinate mature seeds of seven species representing several accessions for each were unsuccessful.

Key to species of *Lithomyrtus*

1. Leaves linear, 10–51 mm long and 1–3 mm wide; Northern Territory **7. *L. linariifolia***
Leaves narrowly elliptic to ovate or obovate 2
2. Leaves 26–61 mm long, 10–46 mm wide; Northern Territory **4. *L. grandifolia***
Leaves mostly less than 25 mm long and less than 20 mm wide 3
3. Leaf bases cordate 4
Leaf bases truncate or cuneate 6
4. Plants prostrate; peduncles in fruit often longer than subtending leaves;
Northern Territory **10. *L. repens***
Plants erect; peduncles in fruit generally shorter than subtending leaves 5
5. Base of leaf blades clasping stem; petiole up to 0.5 mm; leaves mostly
eglandular abaxially; Northern Territory **6. *L. kakaduensis***
Base of leaf blades free from stem; petiole mostly greater than 1 mm
long; leaves always glandular abaxially; Northern Territory **1. *L. cordata***
6. Plants prostrate; Northern Territory **10. *L. repens***
Plants erect 7
7. Leaves less than 30 mm long and less than 2 mm wide; Queensland **8. *L. microphylla***
Leaves mostly longer than 30 mm and greater than 2 mm wide 8
8. Leaf blades eglandular abaxially (rarely glandular in *L. hypoleuca* and *L. obtusa*) 9
Leaf blades glandular abaxially 11
9. Leaf blades narrowly elliptic; tips of sepal lobes mostly held above fruit;
Northern Territory **3. *L. dunlopia***

- Leaf blades broadly elliptic to ovate or obovate; tips of sepal lobes reflexed and held adjacent to fruit 10
10. Bracteoles not exceeding base of sepal lobes in flower; anther connectives eglandular; lateral abaxial leaf veins invisible; Northern Territory, Queensland **5. *L. hypoleuca***
- Bracteoles exceeding base of sepal lobes in flower; anther connectives glandular; lateral abaxial leaf veins clearly visible; Northern Territory, Queensland **9. *L. obtusa***
11. Oil glands often inconspicuous (use magnification); plants usually less than 1 m tall; foliage relatively dense and mostly evenly distributed on stems; petioles not channelled adaxially; tips of sepal lobes mostly erect; Northern Territory **2. *L. densifolia***
- Oil glands visible without magnification; plants usually greater than 1 metre tall; foliage not dense and often concentrated near branch tips; petioles channelled adaxially; tips of sepal lobes reflexed 12
12. Foliage oil glands ferruginous, unequal in size; leaf blades narrowly elliptic to elliptic or obovate, cuneate at base; petals 3–6 mm long; anther connectives usually with several glands; fruit globular to subglobular, 3–6 mm long, glabrous to sparsely villous; Western Australia, Northern Territory, Queensland **11. *L. retusa***
- Foliage oil glands yellow-green, equal in size; leaf blades narrowly ovate to ovate, cordate or truncate at base; petals 7–12 mm long; anther connectives usually with a single gland; fruit subcylindrical, 7–12 mm long, sparsely tomentose to tomentose; Northern Territory **3. *L. cordata***

1. *Lithomyrtus cordata* (A.J. Scott) N.Snow & Guymer *comb. nov.*

Myrtella cordata A.J. Scott, Kew Bull: 33: 301 (1978). **Type:** Australia. Northern Territory. DARWIN AND GULF REGION: Deaf Adder Basin, 10 Jun 1972, R. Schodde AE81 (holo: K; iso: CANB, DNA, L, NT).

Erect shrubs to small trees, 1–5 m tall. Bark smooth or stringy, brown, grey or orangish. Branchlets tomentose, oil glands present and prominent or absent. Leaves opposite, mostly concentrated near branch tips, soft, hairy, petioles 1.5–6 mm long, channelled, adaxially eglandular or glandular. Leaf blades narrowly ovate to ovate, 12–48 mm long, 5–26 mm wide, base often cordate or occasionally truncate, apex obtuse or acute, margins revolute, adaxial surface sparsely short villous, glabrescent, midvein impressed, adaxial surface shortly and densely tomentose, glands of lower surface visible and about the same size, marginal veins of lower surface prominent (usually), or invisible or indistinct (occasionally). Peduncles

rigid, 3–14 mm long, tomentose. Bracteoles 4–5 mm long, c. 0.5 mm wide, the tips (in flower) not exceeding base of sepal lobes, or rarely exceeding base of sepal lobes, tomentose, persistent in fruit. Hypanthium tomentose. Sepal lobes 2.5–4.5 mm long, apex mostly acuminate or rarely acute, villous or tomentose, persistent in fruit, mostly reflexed towards body of fruit. Petals white to magenta, elliptic to ovate or obovate, 8–13 mm long, upper surface glabrous, glabrescent or sparsely sericeous, lower surface sericeous to villous. Stamens 5–9 mm long, anther connectives glandular. Style 9–14 mm long, flexuous, sparsely sericeous. Fruit subcylindrical, base rounded, 7–12 mm long, 6–9 mm wide, sparsely tomentose to tomentose, yellow-green or olive-green to whitish. Peduncle 3–14 mm long in fruit. Radicle tip somewhat spirally contorted above or below plane of embryo. Fig. 4P–W.

Selected specimens: Northern Territory. DARWIN AND GULF DISTRICT: Headwaters East Alligator River, 12°47'S, 133°21'E, May 1997, Guymer 2503 et al. (BRI, DNA, CANB); Arnhem Land, edge of Wellington Range, c. 40

km SSE of Murganella settlement, 11°49'34.7"S, 133°03'15.3"E, May 1997, *Snow & Mangion* 7420 (AD, BRI, CANB, DNA, K, NSW, MEL, MO, PERTH); Kakadu N.P., ca 25 km NE of Jabiru, 12°30'30.4"S, 132°57'08.1"E, May 1997, *Snow* 7437 et al. (BRI, CANB, DNA, L, MO, US); Head of Koolpin Creek, 13°26'06"S, 132°39'13"E, Apr 1995, *Leach* 4382 & *Greshke* (DNA); Kakadu N.P., Mt Brockman, c. 16 km SE of Jabiru, 12°47'37.8"S, 132°55'42.9"E, May 1997, *Snow* 7447 et al. (BRI, CANB, DNA, L, NSW, PERTH); 1–2 miles S [of] Cannon Hill, Aug 1972, *Martenz* AE261 (BRI, DNA); East Alligator River near Cahills Crossing on road to Oenpelli, 12°27'S, 132°58'E, Jun 1974, *Pullen* 9446 (BRI, CANB, DNA, MEL); 10 km W [of] Island Lagoon, Mudginberry Stn, May 1976, *Brown* s.n. (BRI); Arnhem Land, Magela Creek upper catchment, 12°49'19"S, 133°00'25"E, Apr 1995, *Cowie* 5608 & *Brennan* (BRI, DNA); Deaf Adder Gorge, 13°07'S, 132°56'E, Apr 1980, *Dunlop* 5466 (AD, BRI, CANB, DNA); Little Nourlangie Rock, 12°52'S, 132°48'E, Aug 1978, *Dunlop* 5005 (BRI, CANB, DNA, MEL); Kakadu N.P., Twin Falls, 13°19'S, 132°50'E, Sep 1980, *Dunlop* 5539 (BRI, CANB, MEL); c. 4 miles NNE of Mudginberry HS, Jul 1972, *Lazarides* 7526 (BRI, CANB); 3 km S of Naradje Ck crossing, 500 m W of Oenpelli Road, 12°28'S, 132°53'E, May 1988, *Bishop* 840 (DNA); Jabiluka Lease, sandstone outcrop at north end, 12°29'S, 132°54'E, Jun 1992, *Taylor* 103 (DNA); 11.5 km NE of Jabiru E, 12°35'S, 132°58'E, May 1980, *Craven* 5939 (CANB, DNA); Arnhem Land, sources of Goomadeer River, 12°34'S, 133°23'E, Jun 1978, *Henshall* 1987 (DNA); 25 km from Jabiru towards Oenpelli, 12°32'S, 132°55'E, May 1988, *Munir* 5771 (DNA); 16 km SW of East Alligator River crossing, 12°28'S, 132°55'E, Jun 1972, *Maconochie* 2273 (DNA); Koongarra Saddle, Kakadu N.P., 12°51'S, 132°51'E, Aug 1985, *Wightman* 2032 (DNA); Nabarlek, 12°19'S, 133°19'E, Jun 1988, *Hinz* 34 (DNA); Kakadu N.P., Upper Gimbat Creek, 13°34'S, 133°00'E, Apr 1990, *Cowie* 1151 & *Leach* (BRI, DNA, MEL); Koongarra Jump-up, 12°51'S, 132°50'E, May 1978, *Rice* 2617 (CANB); 17.5 km NE of Jim Jim Falls, 13°08.5'S, 132°56'E, May 1980, *Craven* 6108 (CANB).

Distribution and habitat: Darwin and Gulf Region, Northern Territory. Growing in rocky areas amongst the escarpments and slopes of Kakadu National Park and in Arnhem Land, in sandy or rocky soils.

Phenology: Flowering mostly April to July; fruiting May to November.

Notes: Plants of *Lithomyrtus cordata* are the tallest-growing in the genus. Their leaf shape varies from broadly ovate to narrowly ovate or almost elliptic with bases truncate or cordate. This is the only species of *Lithomyrtus* typically having both abaxial leaf glands and prominent abaxial lateral veins, although the latter are not always conspicuous. This combination also

occurs rarely in *L. obtusa* but these species are allopatric. The ferruginous foliage glands on *Gittins* 2886 (BRI, CANB) from near the East Alligator River suggests hybridisation with *L. retusa*. Several of the specimens cited by Scott (1978) as paratypes of *Myrtella cordata* have been found to belong to other species of *Lithomyrtus*.

Conservation status: The species is widespread and can be locally common.

2. *Lithomyrtus densifolia* N.Snow & Guymmer, sp. nov. Plantae erectae, plerumque minores quam 1 metrum altae, in ambitu rotundatae, dense foliosae ramosaeque. Folia anguste elliptica, subtus glandes inconspicuas et venas secundarias laterales prominentes gerentia. Fructus plerumque cylindrici, glabri usque sparse tomentosi. **Typus:** Australia. Northern Territory. DARWIN AND GULF REGION: Upper East Alligator River, Arnhem Land, 12°49'30"S, 133°21'59"E, 13 May 1997; *C. Mangion* 400 & *P.S. Short* (holo: DNA; iso: AD, BRI, CANB, CHR, K, HO, L, NSW, MEL, GREE, MO, PERTH, UPS, US [Note: type material represents either of the two genotypes collected, indicated on labels as A collection or B collection]).

Mostly erect, compact, densely branching shrubs, 0.3–1 (–1.5) m tall. Bark stringy, orangish or brown. Branchlets tomentose, oil glands lacking. Leaves opposite, evenly distributed, soft (younger) or coriaceous (older). Petioles 1–1.5 mm long, rounded, eglandular or glandular. Leaf blades narrowly elliptic, 6–15 (–20) mm long, 1.5–3.5 mm wide, base cuneate, free from the stem, apex obtuse, margins revolute or flat, upper surface glabrescent or sparsely short-villous, adaxial midvein impressed, lower surface villous to densely villous, oil glands of lower surface visible and about the same size (but usually faint), marginal veins of lower surface invisible or indistinct. Peduncles rigid, 5–12 mm long, villous. Bracteoles 3–5 mm long 0.5–0.7 mm wide, the tips (in flower) not exceeding base of sepal lobes, villous to tomentose, caducous in fruit. Hypanthium tomentose. Sepal lobes 2.5 mm long; apex acute, tomentose, persistent in

fruit, mostly ascending and above body of fruit. Petals pink to magenta, ovate to obovate, 5–8.5 mm long, upper surface mostly glabrous, lower surface sericeous to villous. Stamens 2–7 mm long, anther connectives glandular. Style 5–8 mm long, flexuous, glabrous. Fruit cylindrical or rarely fusiform, base rounded or tapered, 6–10 mm long, 3–5.5 mm wide, glabrescent to sparsely tomentose, yellow-green or olive-green. Radicle tip spirally contorted above or below plane of embryo, or held at same horizontal plane as embryo. Fig. 5A–G.

Selected specimens: Northern Territory. DARWIN AND GULF REGION: Arnhem Land, 15 km SE of Jabiru, 12°47'S, 132°56'E, Apr 1989, *Johnson* 4770 (BRI); Kakadu N.P., 14.9 km (by road) from Pine Creek/Jabiru road (Kakadu Hwy), on road to Koongarra Saddle, c. 16.3 km S of Jabiru, 12°50'S, 132°51'E, May 1992, *West* 5311 (CANB, DNA); Mt. Gilruth area, in sand amongst rocks on sandstone escarpment, 12°58'S, 133°10'E, Jun 1978, *Dunlop* 4877 (DNA, PERTH); Koongarra area, 1 km S of jumpup, 12°51'S, 132°51'E, Apr 1979, *Rankin* 1981 (BRI, DNA); Kakadu N.P., 6 km SW of Mt. Brockman, 12°46'S, 132°54'E, Apr 1980, *Telford* 8086 & *Wrigley* (CANB); Headwaters of the Liverpool River, Arnhem Land, 12°46'S, 133°44'E, Apr 1984, *Wightman* 1444 & *Craven* (BRI, CANB, DNA); Headwaters East Alligator River, 12°47.76S, 133°21.61S, May 1997, *Guymer* 2505 et al. (BRI, DNA, CANB); Kakadu N.P., Little Nourlangie Rock, 12°52'S, 132°47'E, Aug. 1980, *Telford* 8459 & *Wrigley* (CANB); Vicinity of Nourlangie Rock, Jul 1972, *Martensz* AE114 (DNA); Giddy River area, Gove, Oct 1971, *Hinz* 71–1610B (DNA); Arnhem Land, 12°54'S, 135°27'E, Jun 1972, *Latz* 2957 (CANB, DNA); Doyndji area, 12°55'S, 135°24'E, Oct 1976, *Scarlett* 30 (DNA); 1.5 km NE of Koongarra, 12°52'S, 132°51'E, Sep 1978, *Rankin* 1390 (CANB, DNA); Mt. Brockman, 12°46'S, 132°54'E, Apr 1980, *Dunlop* 5490 (CANB, DNA); Koongarra Saddle, NE of Nourlangie Rock, 12°51'S, 132°52'E, May 1988, *Munir* 5750 (DNA); Upper East Alligator River, Arnhem Land, 12°49'S, 133°21'E, Apr 1988, *Russell-Smith* 5226 & *Lucas* (DNA); c. 17 km SE of Jabiru, 12°47.5'S, 132°57.5'E, *Craven* 6595 (CANB, DNA, MEL); Buffalo Springs, Mt. Brockman, 5 km NE of Koongarra, 12°50'S, 132°53'E, May 1980, *Lazarides* 8910 (CANB, DNA); Arnhem Land, Magela Creek upper catchment, 12°49'02"S, 133°00'19"E, Apr 1995, *Cowie* 5672 & *Brennan* (CANB, DNA); Kakadu N.P., Mt. Brockman, 12°50'00"S, 132°55'17"E, Mar 1995, *Egan* 4624 (DNA); Kakadu N.P., 12°50'S, 132°51'E, May 1988, *Munir* 5717 (DNA); Kakadu N.P., Mt. Brockman area, 12°48'S, 132°54'E, Mar 1995, *Russell-Smith* 10239 (DNA); Kakadu N.P., Koongarra Saddle, 12.51S, 132.51E, Nov 1991, *Leach* 2904 & *Dunlop* (CANB, DNA); Little Nourlangie Rock, 12°52'S, 132°48'E, Mar 1979, *Dunlop* 4948 (CANB, DNA); Near Koongarra Saddle, 1.5 km N of Koongarra, 12°51.5'S, 132°51.5"E, May 1980, *Craven* 5717 (CANB, DNA); Mt. Gilruth, Feb 1977, *Dunlop* 4431 (CANB); Kakadu N.P., Little

Nourlangie Rock, 12°52'S, 132°47'E, Apr 1980, *Telford* 7789 & *Wrigley* (CANB); Koongarra, 12°51'S, 132°52'E, May 1978, *Rice* 2637 (CANB).

Distribution and habitat: Northern Territory; Darwin and Gulf Region. Sandstone escarpments, scree slopes and ledges, in open shrublands; soils skeletal or sandy.

Phenology: Flowering February to June; fruiting April to November.

Notes: *Lithomyrtus densifolia* and *L. dunlopii* are distinct in the field but herbarium material can be very similar in appearance. In the field, *L. densifolia* is a compact, spreading, densely branching shrub usually less than a metre tall, with abundant grey-green leaves occurring densely throughout whereas *L. dunlopii* is a straggly, openly branching shrub to 1.5 m. The peduncles of mature fruits of *L. dunlopii* generally exceed 10 mm in length, whereas those of *L. densifolia* are usually shorter than 10 mm. The fruits of *L. densifolia* are highly aromatic when crushed.

Conservation status: Although the species is not locally common, its wide distribution does not suggest any vulnerability at this time.

Etymology: The specific epithet is derived from Latin and refers to the close spacing of the leaves.

3. *Lithomyrtus dunlopii* N.Snow & Guymer **sp. nov.** Plantae erectae. Folia anguste elliptica, venis secundariis lateralibus prominentibus plerumque carentia. Pedunculi fructum folia plerumque paulo longiores. Fructus cylindrici, raro fusiformes, sparse villosi. **Typus:** Australia. Northern Territory: Arnhem Land, along mostly abandoned track c. 7.1 km NE of Murganella Settlement, 11°32'08.7"S, 132°56'13.7"E, May 1997, *N.Snow* 7419 & *C.Mangion* (holo: DNA; iso: BRI, CANB, K, L, MEL, MO, NSW, US).

Erect shrubs 0.7–1.5 (–2) m tall. Bark stringy, brown or orangish. Branchlets villous or tomentose, oil glands lacking. Leaves opposite, mostly evenly distributed, soft but becoming coriaceous. Petioles 1.5–4 mm long, rounded,

eglandular. Leaf blades narrowly elliptic, 10–40(–55) mm long, (3–)6–10 mm wide, base narrowly cuneate, free from the stem, apex obtuse, margins revolute or flat, upper surface glabrescent to sparsely short villous, adaxial midvein impressed, lower surface villous to tomentose, oil glands of lower surface not visible, marginal veins of lower surface invisible or indistinct. Peduncles rigid, sparsely villous to villous, 10–30 mm long. Bracteoles 3–3.6 mm long, c. 0.5 mm wide, tips (in flower) exceeding base of sepal lobes or not, tomentose, caducous in fruit. Hypanthium tomentose. Sepal lobes 1.5–3.3 mm long; apex acute or acuminate, sparsely tomentose to tomentose, persistent in fruit, mostly ascending and above body of fruit. Petals white to magenta, ovate to broadly ovate, 5.5–6.8 mm long, upper surface sparsely sericeous, lower surface tomentose. Stamens 4–5 mm long; anther connectives glandular. Style 4–5 mm long, flexuous or mostly straight, glabrous or sparsely sericeous. Fruit cylindrical or rarely fusiform, base tapered, 7–10 mm long, 4–5.5 mm wide, sparsely villous, yellow-green or olive-green. Radicle tip somewhat spirally contorted above or below plane of embryo. Fig. 5H–N.

Selected specimens: Northern Territory. DARWIN AND GULF REGION: Arnhem Land, along track bearing east-west towards Gningarg Point, from Murganella settlement, 11°28'30.8"S; 132°56'31.6"E, May 1997, *Snow* 7418 & *Mangion* (BRI, CANB, DNA, K, L, NSW, MO, PERTH, US); Kakadu N.P., c. 25 km NE of Jabiru, 12°29'58.3"S; 132°56'52.0"E, May 1997, *Snow* 7441 *et al.* (BRI, CANB, DNA, NSW, K, MO); Arnhem Land, edge of Wellington Range, c. 40 km SSE of Murganella settlement, 11°49'34.7"S; 133°03'15.3", May 1997, *Snow* 7421 & *Mangion* (BRI, UPS); Kakadu N.P., 6.5 km SSW of Mt. Brockman, 12°48'S, 132°56'E, *Telford* 8040 & *Wrigley* (CANB); Arnhem Land, Flinders Peninsula, 12°06'S, 135°59'E, May 1992, *Cowie* 2768 (DNA, MEL); c. 22 km NE of Jabiru, 12°31'S, 132°58.5'E, Mar 1981, *Craven* & *Whitbread* 6604 (CANB, DNA, MEL); Upper Liverpool River, 12°26'S, 134°04'E, Sep 1976, *Duncan* s.n. (DNA); Kakadu N.P., near Cannon Hill, 12.29S, 132.55E, Mar 1983, *Russell-Smith* 522 (DNA); 15 km NNE of Jabiru East, 12°32'S, 132°57'E, Jun 1980, *Craven* 6458 (DNA); Headwaters of East Alligator River, Arnhem Land, 12°48'S, 133°21'E, Mar 1984, *Wightman* 1376 & *Craven* (BRI, CANB, DNA); Nabarlek, 12°17'S, 133°19'E, Apr 1979, *Rankin* 2093 (BRI, CANB, DNA); Mt. Brockman, 12°45'S, 132°56'E, Apr 1980, *Dunlop* 5501 (CANB, DNA); Upper East Alligator River, Arnhem Land, 12.50S, 133.20E, Apr 1988, *Russell-Smith* 5268 & *Lucas* (BRI, DNA); c. 8 km NNE of Jabiru, 12°35'53"S, 132°59'34"E,

Apr 1995, *Egan* 4826 (BRI, CANB, DNA); 11.5 km NE of Jabiru East, 12°35'S, 132°58'E, May 1980, *Craven* 5938 (CANB, DNA); Arnhem Land, Murganella Settlement, vicinity and west of Workshop Road, 11°32'48.3"S, 132°55'25.3"E, May 1997, *Snow* 7414 & *Mangion* (BRI, DNA, L, UPS); Kakadu N.P., c. 25 km NE of Jabiru, 12°30'24.9"S, 132°57'05.5"E, *Snow* 7432 *et al.* (BRI, DNA); Giddy River area, Gove, Oct 1971, *Hinz* 71–1610B (CANB, DNA); Nabarlek, 12.20S, 133.16E, *Hinz* 46 (DNA); North Caledon Bay, Oct 1968, *Byrnes* NB964 (DNA); Gimbat River Station, source of South Alligator River, 13°45'S, 132°38'E, Jul 1983, *Russell-Smith* 748 (DNA); 15 km NNE of Jabiru East, 12°32'S, 132°57'E, Jun 1980, *Craven* 6458 (CANB); Cato River Rd, 6.5 km N Dahlinbury turnoff, 12°21'S, 136°25'E, Sep 1987, *Clark* 1694 (DNA); Marchinbar Island South, Hopeful Bay, 11°25'38"S, 136°29'60"E, Sep 1994, *Brennan* 2900 (DNA); Wessel Islands, 11°26'S, 136°31'E, Oct 1972, *Latz* 3480 (DNA).

Distribution and habitat: Northern Territory; Darwin and Gulf Region. Occurs in heaths, woodlands or *Allosyncarpia ternata* S.T.Blake forests, along sandstone escarpments and outcrops; soils sandy or lateritic.

Phenology: Flowering April to August; fruiting April to November.

Notes: *L. dunlopii* most resembles *L. densifolia*. The tips of the bracteoles of *L. dunlopii* occasionally exceed the base of the sepal lobes (e.g., *Russell-Smith* 5381 & *Lucas* (BRI); *Egan* 4826 (BRI)), an attribute which otherwise usually occurs only in *L. obtusa*. However, the known distributional ranges of *L. dunlopii* and *L. obtusa* do not overlap. A few specimens of *L. dunlopii* with narrowly elliptic leaves approach *L. linariifolia* (*Egan* 4826 [BRI]), but the dense pubescence on the abaxial leaf surface distinguishes them from the latter. The three specimens (*Clark* 1694, *Brennan* 2900, *Latz* 3480) need further study; they resemble specimens of *L. densifolia*, but are tentatively placed under *L. dunlopii* here because oil glands are not clearly visible on the abaxial leaf surfaces.

Conservation status: The frequent occurrence of subpopulations in excess of fifty individuals, recruitment of seedlings in extant subpopulations (Snow, pers. obs.) and the known number of collections indicate this species is not of conservation concern at this time.

Etymology: The specific epithet honours Clyde Dunlop of the Northern Territory Herbarium,

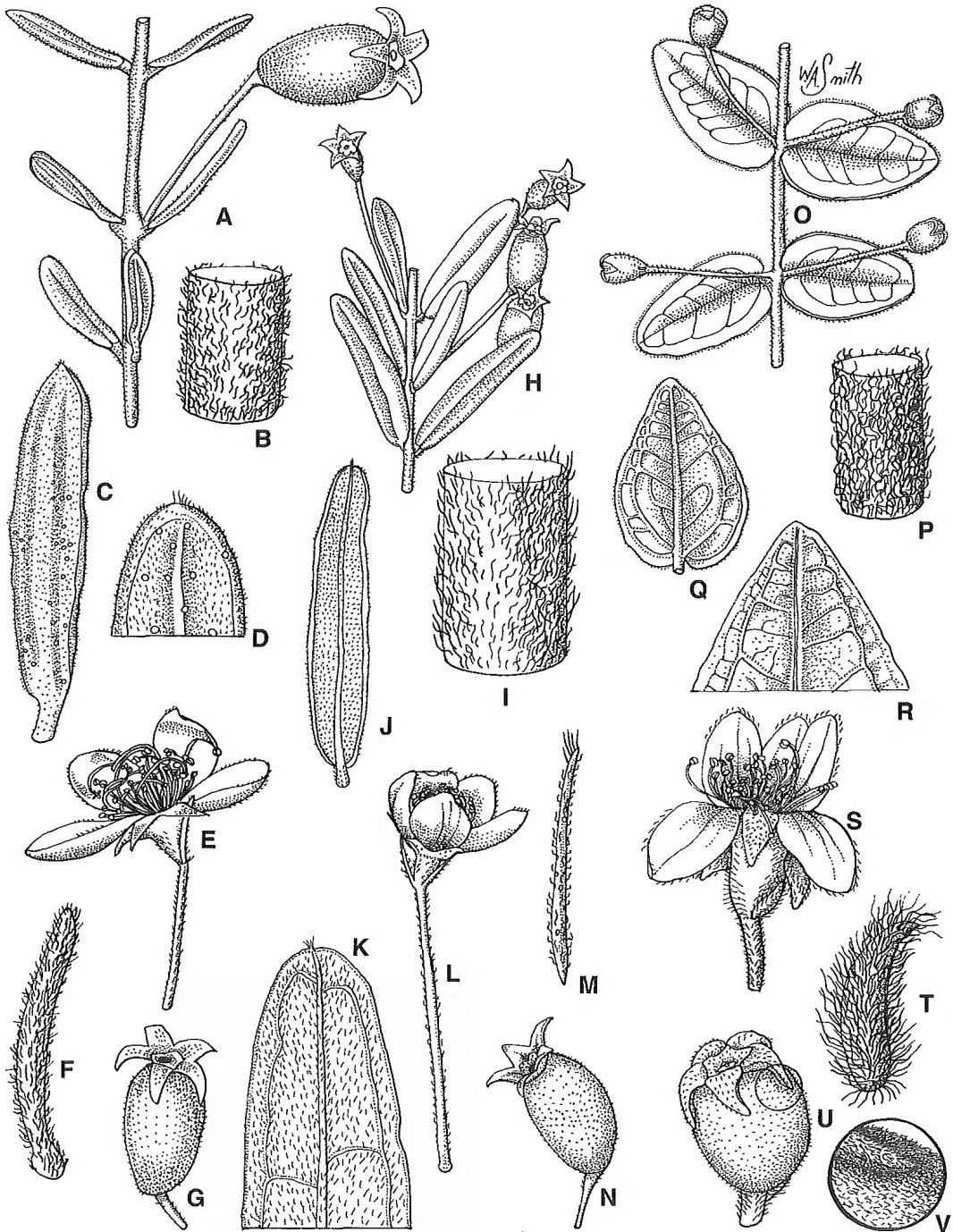


Figure 5. A–G: *Lithomyrtus densifolia*. A. fruiting branchlet $\times 2$. B. section of branchlet $\times 16$. C. abaxial leaf profile $\times 4$. D. adaxial leaf apex $\times 8$. E. flower $\times 2$. F. bracteole $\times 8$. G. fruit $\times 2$. A–D, G: *Mangion* 400B & *Sharp*. E–F: *Russell-Smith* 10239. **H–N: *L. duntopii*.** H. fruiting branchlet $\times 1$. I. section of branchlet $\times 16$. J. abaxial leaf profile $\times 2$. K. adaxial leaf apex $\times 6$. L. flower and peduncle $\times 2$. M. bracteole $\times 8$. N. fruit $\times 2$. H–N: *Snow* 7419 *et al.* **O–Y: *L. grandifolia*.** O. fruiting branchlet $\times 0.5$. P. section of branchlet $\times 8$. Q. abaxial leaf profile $\times 0.5$. R. adaxial leaf apex $\times 1$. S. flower $\times 2$. T. bracteole $\times 8$. U. fruit $\times 1.5$. V. detail of sepal lobe and fruit $\times 4$. O–P: *Snow* 7444–B *et al.* Q–R, U–V: *Snow* 7443 *et al.* S–T: *Wightman* 1377 & *Craven*. All DNA.

who has made many important collections of this taxon and other species of *Lithomyrtus*.

4. *Lithomyrtus grandifolia* N.Snow & Guymer sp. nov. Plantae adscendentes usque erectae. Folia magna, late elliptica usque ovata, basibus cordatis autem haud amplexicaulibus; pagina inferior foliorum dense hirsuta, venas secundarias laterales prominentes gerens sed glandibus carens. Fructus subglobosi usque globosi, dense tomentosi. **Typus:** Australia. Northern Territory. DARWIN AND GULF REGION: Kakadu National Park, c. 25 km NE of Jabiru, underneath overhang of large sandstone outcrop, 12°29'12.2"S, 132°56'37.8"E, 15 May 1997, N.Snow 7444 et al. (holo: DNA; iso: BRI, CANB, K, L, MO).

Shrubs 0.6–2 m tall, stems erect (or merely ascending). Bark stringy, orangish. Branchlets tomentose, oil glands lacking. Leaves opposite, mostly evenly distributed, soft. Petioles 1.8–4 mm long, channelled, eglandular. Leaf blades ovate, (17–)25–61 mm long, 10–46 mm wide, base cordate, clasping (occasionally, especially the youngest leaves) or free from the stem, apex obtuse to acute (rarely), the margins flat, upper surface glabrescent to sparsely tomentose, adaxial midvein impressed, lower surface tomentose, glands of lower surface not visible, marginal veins of lower surface prominent. Peduncles rigid, 9–51 mm long in flower, villous to tomentose. Bracteoles 4–6 mm long, c. 1 mm wide, tips (in flower) not exceeding base of sepal lobes, densely villous to tomentose, persistent in fruit. Hypanthium tomentose. Sepal lobes 4–7 mm long, apex acuminate, villous to tomentose, persistent in fruit, mostly reflexed towards body of fruit. Petals pink, elliptic to ovate, or obovate, 9–11 mm long, upper surface glabrous, lower surface villous to tomentose. Stamens 6–8 mm long; anther connectives eglandular. Style 5–7 mm long, flexuous, glabrous. Fruit mostly globose, base rounded, 11–13 mm long, 8–10 mm wide, tomentose, whitish. Radicle tip not spirally contorted, held at same plane as embryo. Fig. 5O–Y.

Specimens examined: Northern Territory, DARWIN AND GULF REGION: Kakadu N.P., c. 25 km NE of Jabiru, 12°30'15.2"S, 132°57'08.6"E, May 1997, Snow 7430 et al. (BRI, DNA); Kakadu N.P., c. 25 km NE of Jabiru,

near top of sandstone cliff arising some 20 metres, 12°30'38.7"S, 132°57'06.4"E, Snow 7439 et al. (BRI, DNA, MEL, PERTH, UPS); Kakadu N.P., c. 25 km NE of Jabiru, deeply dissected sandstone crevices, 12°30'30.4"S, 132°57'08.1"E, Snow 7438 et al. (BRI, DNA, GREE, NSW, US); Kakadu N.P., c. 25 km NE of Jabiru, 12°30'24.9"S, 132°57'05.5"E, Snow 7433 et al. (BRI); Kakadu N.P., remote area c. 25 km NE of Jabiru, 12°30'15.2"S, 132°57'08.6"E (BRI, DNA); Kakadu N.P., c. 25 km NE of Jabiru, very base of vertical sandstone outcropping in sandy soil, 12°29'28.5"S, 132°56'40.8"E, May 1997, Snow 7442 et al. (BRI, DNA, CANB, K, L, MO); Kakadu N.P., c. 25 km NE of Jabiru, underneath overhang at very base of sandstone cliff in complete shade, 12°29'16.2"S, 132°56'40.1"E, May 1997, Snow 7443 et al. (BRI, DNA, K, MO); Northern Kakadu, 12°32'S, 132°39'E, Apr 1983, King 226 (DNA); Headwaters of the East Alligator River, Arnhem Land, 12°48'S, 133°21'E, Mar 1984, Wightman 1377 & Craven (AD, BRI, CANB, DNA, PERTH); East Alligator River, 13°01'S, 133°25'E, Nov 1987, Dunlop 7308 (BRI, DNA); ESE Mudginberry, 12°36'S, 132°58'E, Feb 1973, Dunlop 3297 (BRI, DNA); East Alligator River, 38 miles SSE of Oenpelli, 12°47'S, 133°21'E, Jul 1972, Adams 2866 (BRI, DNA); Magela Creek, Sept 1970, Byrnes 1973 (DNA); Nabarlek, 12°30'S, 133°21"E, Feb 1989, Hinz 418 (CANB, DNA); 19 km E of Jabiru, 12°37'S, 133°03'E, Russell-Smith 8032 & Lucas (DNA); 18 km NNE of Jabiru East, 12°30.5S, 132°57'E, Jun 1980, Craven 6360 (CANB, DNA); 14.5 km NE of Jabiru East, 12°33.5'S, 132°59'E, May 1980, Craven 5967 (CANB, DNA); Kakadu N.P., 7 km NNE of Jabiru, 12°35'52"S, 132°59'27"E, Apr 1995, Egan 4782 & Knox (DNA); 20 km S of Nabarlek, 12°30'S, 133°21'E, Jul 1989, Hinz 551 (DNA); Upper East Alligator River area, Arnhem Land, 12°39'S, 133°29'E, Feb 1991, Russell-Smith 8424 & Brock (DNA); 44 km SE Oenpelli, 12°34'S, 133°23'E, Jun 1978, Dunlop 4916 (DNA); Arnhem Land, 19 km E of Jabiru, 12°37'S, 133°03'E, Apr 1989, Johnson 4514 (BRI).

Distribution and habitat: Northern Territory, Darwin and Gulf Region. Often growing in the semi-shaded overhangs at base of sandstone escarpments; in sandy soils.

Phenology: Flowering February to May; fruiting April to November.

Notes: The species is unmistakable in the genus because of its leaf size. It is prone to mealy bug and ophiostomoid fungal infestations (Snow, pers. obs.).

Conservation status: Given the relatively few collections, subpopulation sizes of usually less than fifteen individuals, and the observed lack of seedling recruitment (Snow and Guymer, pers. obs.), the species is considered vulnerable (criterion D1).

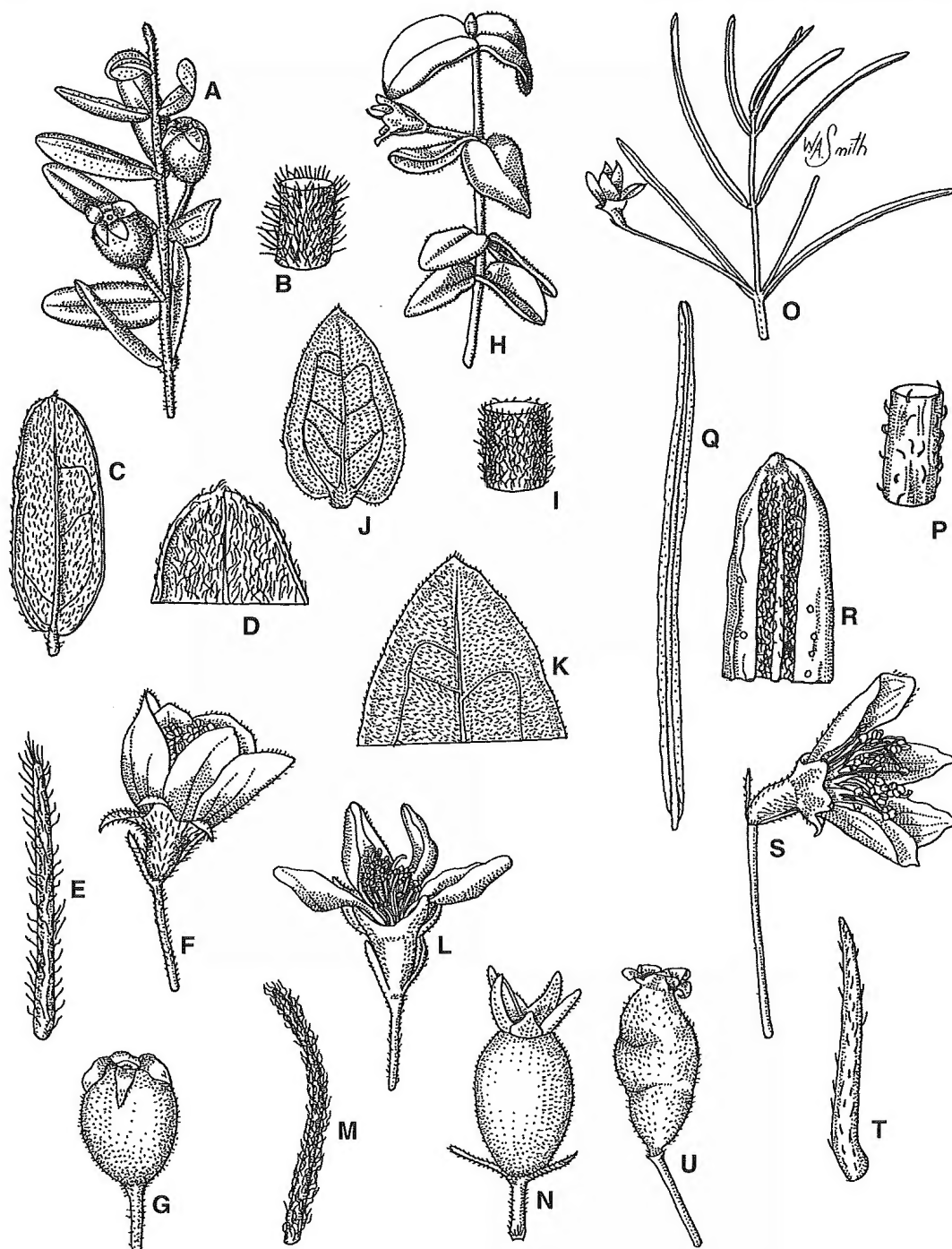


Figure 6. A–G: *Lithomyrtus hypoleuca*. A. fruiting branchlet $\times 1$. B. section of branchlet $\times 8$. C. abaxial leaf profile $\times 2$. D. abaxial leaf apex $\times 4$. E. bracteole $\times 16$. F. flower $\times 3$. G. fruit $\times 2$. A–D, G. *Latz* 7335 (DNA). E–F. *Egan* 4861(DNA). **H–N: *L. kakaduensis*.** H. flowering branchlet $\times 1$. I. section of branchlet $\times 8$. J. abaxial leaf profile $\times 2$. K. adaxial leaf apex $\times 4$. L. flower $\times 2$. M. bracteole $\times 8$. N. fruit $\times 1.5$. H–N. *Snow* 7450 *et al.* (BRI). **O–U: *L. linariifolia*.** O. flowering branchlet $\times 1$. P. section of branchlet $\times 16$. Q. abaxial leaf profile $\times 2$. R. abaxial leaf apex $\times 16$. S. flower $\times 3$. T. bracteole $\times 16$. U. fruit $\times 2$. O–T: *Craven* 8248 & *Wightman* (DNA). U: *Cowie* 1109 & *Leach* (BRI).

Etymology: The specific epithet is derived from Latin and refers to the large leaves of the species.

5. *Lithomyrtus hypoleuca* F. Muell. ex N. Snow & Guymer **sp. nov.** Plantae erectae. Folia plerumque elliptica; pagina inferior foliorum dense hirsuta, glandibus nullis vel raro praesentibus et venis secundariis lateralibus prominentibus carens. Fructus plerumque cylindrici, glabrescentes usque villosi. **Typus:** Australia. Northern Territory. DARWIN AND GULF REGION: McArthur River station, Abner Ranges, 16°44'45"S, 135°57'31"E, 21 May 1997, C. R. Michell & D. S. Calliss 869 (holo: DNA; iso: BRI, CANB, K, MEL, MO, NSW).

Shrubs 0.5–1.5 m tall, stems erect or ascending. Bark smooth or stringy, brown, grey or orangish. Branchlets tomentose, oil glands lacking. Leaves opposite, mostly concentrated near branch tips or evenly distributed, soft but becoming coriaceous. Petioles 1–2.5 mm long, channelled (slightly), glandular. Leaf blades narrowly elliptic to ovate, 10–33 mm long, 6–12 mm wide, base truncate or cuneate, apex obtuse, margins revolute, upper surface glabrescent to sparsely short villous, adaxial midvein impressed, lower surface tomentose, glands of lower surface not visible, marginal veins of lower surface invisible or absent. Peduncles rigid, 6.5–19 mm long, sparsely villous to villous. Bracteoles 3–4.7 mm long, 0.4–0.7 mm wide, tips (in flower) not exceeding base of sepal lobes, densely villous, caducous in fruit. Hypanthium densely villous. Sepal lobes 3.2–4 mm long, apex acute or acuminate, villous, persistent or deciduous in fruit, mostly reflexed towards body of fruit. Petals pink, ovate to obovate, 5.5–9 mm long, upper surface glabrous, lower surface villous. Stamens 2.5–6 mm long; anthers connectives eglandular. Style 3–9 mm long, flexuous, sparsely sericeous. Fruit subcylindrical, base rounded, 6–9 mm long, 4.5–7 mm wide, glabrescent to villous, whitish. (Embryos not seen.) Fig. 6A–G.

Specimens examined: Northern Territory. DARWIN AND GULF REGION: 14 km NE of Mann River Gorge, 12°39'S, 134°08'E, Nov 1987, Leach & Dunlop 1594 (BRI, DNA); Near Magela Creek, 13.5 km SE of Jabiru East, 12°45'S, 132°59'E, Jun 1980, Craven 6337 (CANB); Headwaters E. Alligator River, 12°47'17"S, 133°21'61"E, May 1997,

Guymer 2501 et al. (BRI, CANB, DNA, K, MO); Mt. Brockman, 12°46'S, 132°54'E, Apr 1980, Dunlop 5489 (BRI, CANB); Kakadu N.P., Birdie Creek, 13°57'S, 132°52'E, Apr. 1990, Cowie 1110 & Leach (BRI); Cox River Station, 16°01'S, 134°46'E, Jul 1977, Latz 7335 (DNA); 10 km NNE of Jabiru, Kakadu N.P., 12°34'54"S, 132°59'10"E, Apr 1995, Egan 4861 (CANB, DNA); Kakadu N.P., 5 km S of Cahill's Crossing, East Alligator River, 12°28'S, 132°57'E, Apr 1983, Thompson 306 (CANB); 6 km SW of Mt. Brockman, 12°46'S, 132°54'E, Apr 1980, Telford 8085 & Wrigley (CANB); Beetle Spring, 20 km SE of McArthur River Stn Hmstd, 16°47'S, 135°59'E, Jun 1990, Menkhurst 967 (DNA, MEL); Upper East Alligator River, Arnhem Land, 12°49'S, 133°22'E, Russell-Smith 5914 & Lucas (DNA); 10 miles SSW of Borroloola, Jun 1971, Dunlop 2217 (BRI, CANB). **Queensland.** BURKE DISTRICT: Hells Gate, 17°28'S, 138°22'E, May 1974, Carolin 9171 (BRI); Hells Gate between Doomadgee and Westmoreland Station, May 1974, Pullen 9177 (BRI, CANB); Westmoreland, Big Amphitheatre, 17°24'08"S, 138°15'25"E, May 1997, Forster PIF21046 (BRI); Westmoreland Station, 70 km from Wollgorang towards Burktown, 17°20'S, 138°15'E, Jul 1972, Gittins 2492 (BRI). **COOK DISTRICT:** Gilbert River Holding site EU 553, 19°04'54"S, 143°31'32"E, Apr 1994, Godwin s.n. (BRI [AQ 630612]).

Distribution and habitat: Northern Territory, Darwin and Gulf Region; Queensland, Burke and Cook Districts. Occurring on rocky slopes and sandstone escarpments in open woodlands.

Notes: *Lithomyrtus hypoleuca* is the most difficult species of this genus to identify because it can resemble several other species. It most resembles *L. densifolia*, but can be distinguished from this species by almost always lacking abaxial leaf oil glands, generally having larger and fewer leaves, and having eglandular anther connectives. Embryo characters were not seen in the nine fruits sampled. The species was not seen in the field.

Phenology: Flowering April to June; fruiting June to November.

Conservation status: Although a recent collection (Forster PIF21046) records the species as locally common in the Westmoreland area, the few collections in herbaria suggest the species should be considered vulnerable (criterion D1) pending further information.

Etymology: The specific epithet is from Greek *hypo-*, below or under, and *leuca*, white, a reference to the white underside of the leaves.

6. ***Lithomyrtus kakaduensis*** N.Snow & Guymier **sp. nov.** Plantae plerumque erectae. Folia ovata, apetiolata, basibus cordatis ac amplexicaulibus; pagina inferior foliorum dense hirusta, venas secundarias laterales prominentes gerens autem glandibus carens. Fructus subglobosi usque subcylindrici, villosi. **Typus:** Australia: Northern Territory. DARWIN AND GULF DISTRICT: Kakadu National Park, 5.7 km off Kakadu highway along road to Gunlom, 13°32'20.3"S, 132°20'06.8"E, 18 May 1997, *N.Snow* 7450 et al. (holo: DNA; iso: BRI, CANB, K, L, MEL, MO, NSW, PERTH, US).

Erect shrubs 0.5–2 m tall. Bark smooth, or stringy, orangish. Branchlets tomentose, oil glands lacking. Leaves opposite, concentrated near branch tips or mostly distributed, soft. Petioles 0.2–0.5(–1) mm long, eglandular. Leaf blades ovate to broadly ovate, 9–34 mm long, 6–22 mm wide, base cordate, clasping the stem, apex obtuse, margins revolute, upper surface sparsely short villous to sparsely tomentose, adaxial midvein impressed, lower surface tomentose, oil glands of lower surface not visible, marginal veins of lower surface prominent. Peduncles rigid, 10–20 mm long, sparsely villous to villous. Bracteoles 4–6 mm long, 0.5–0.8 mm wide, tips (in flower) not exceeding base of sepal lobes, villous, persistent or (usually) caducous in fruit. Hypanthium villous to densely villous. Sepal lobes 3–5 mm long, apex acuminate, villous to tomentose, persistent in fruit, mostly ascending and above body of fruit. Petals pink, obovate, 7–9 mm long, upper surface glabrescent to sparsely sericeous, lower surface sericeous. Stamens 4–6 mm long; anther connectives glandular. Style 5–6 mm long, flexuous or mostly straight, glabrous. Fruit subglobose to subcylindrical, base rounded, 7–14 mm long, 6–9.5 mm wide, villous, yellow-green or olive-green or whitish. Radicle tip somewhat spirally contorted above or below plane of embryo. Fig. 6H–N.

Specimens examined: Northern Territory. DARWIN AND GULF REGION: Kakadu N.P., 5.7 km along dirt road to Gunlom from Kakadu Highway, c. 50 m S of road, 13°32'18.5"S, 132°28'12.9"E, May 1997, *Snow* 7448 et al. (BRI, CANB, DNA, K, L, MO, NSW, PERTH); Kakadu N.P., Twin Falls, 13°18'S, 132°51'E, Jul 1983, *Dunlop* 6723 & *Wightman* (BRI, DNA, MEL, PERTH);

Without precise locality, 13°44'S, 132°40'E, Jul 1972, *Lazarides* 7684 (BRI, CANB); Kakadu N.P., 8 km NNE of Mt. Evelyn, 13°32'S, 132°56'E, Apr 1989, *Menkhorst* 343 (BRI, DNA, MEL); Headwaters Katherine River, Arnhem Land, 13°46'15"S, 133°09'03"S, Jul 1996, *Mangion* 237 & *Dunlop* (BRI); Gradys Creek, Arnhem Land, 13°29'S, 133°01'E, Jul 1995, *Merrotsy* 2474A (BRI); Gimbat Station, source of South Alligator River, 13°45'S, 132°38'E, Jul 1983, *Russell-Smith* 743 (DNA, MEL); Jim Jim Creek, 3.5 km ESE of Jim Jim Falls, 13°17'S, 132°52'E, May 1980, *Craven* 5819 (CANB, DNA); Kakadu N.P., adjacent to Round Jungle, 13°18'S, 132°38'E, Apr 1987, *Russell-Smith* 2176 & *Lucas* (DNA); 75 km NE of Pine Creek along road to El Sharana, 13°32'S, 132°21'E, May 1983, *Briggs* 925 (BRI, CANB, DNA); Kakadu Hwy at Gunlom turnoff, 13°33'S, 132°17'E, Dec 1995, *Brennan* 3191 (DNA); UDP Falls road, c. 5.5 km E from Kakadu Hwy, 12°32'S, 132°20'E, Apr 1987, *Purdie* 3228 (CANB, DNA); Headwaters of Twin Creek, 13°26'43"S, 133°51'04"E, Apr 1995, *Leach* 4337 & *Greschke* (DNA); 31 km WSW of Twin Falls, 13°20'S, 132°29.5'E, Jun 1980, *Craven* 6404 (CANB, DNA); 6 km ESE of Twin Falls, 13°22'S, 132°48'E, May 1980, *Craven* 5845 (CANB); Kakadu N.P., Upper Birdie Creek, 13°53'S, 132°57'E, Apr 1990, *Slee & Craven* 2526 (CANB) & 2527 (AD, CANB, MEL); Kakadu N.P., Kakadu Hwy 1.2 km S of entrance to Mary River Ranger Station, 13°33'S, 132°16'E, Apr 1990, *Slee & Craven* 2959 (CANB, MEL).

Distribution and habitat: Northern Territory, Darwin and Gulf Region. On gentle slopes or sandstone ridges with *Eucalyptus phoenicea* F. Muell., *E. miniata* A. Cunn. ex Schauer, *E. tetrodonta* or *Acacia* spp. in sandy soils.

Phenology: Flowering December to May; fruiting May to December.

Notes: Specimens of *L. kakaduensis* with oil glands on the abaxial leaf surface may be hybrids of this species with *L. cordata* or *L. retusa* (viz *Hearne* 1740; *Craven* 6404 [CANB 307316]). The second accession of *Craven* 6404 (CANB 307317) is an intergrade of this species with *L. densifolia*, as evidenced by its dense foliage and abundant fruit on short peduncles.

Conservation status: Although occasionally occurring in subpopulations greater than 10 individuals (Snow, pers. obs.), the absence of seedlings and narrow geographic range suggest the species should be considered vulnerable (criterion D1).

Etymology: The epithet is a contraction of 'Kakadu' and Latin *-ensis* indicating the

occurrence of the species largely within Kakadu National Park.

7. *Lithomyrtus linariifolia* N. Snow & Guymer

sp. nov. Plantae plerumque decumbentes. Folia linearia, glandibus subtus carentia. Pedunculi sparse sericei, folia subtenta usque duplo longiores. Fructus fusiformes, glabri usque sparse villosi. **Typus:** Australia, Northern Territory, Upper East Alligator River, Arnhem Land, 12°39'S, 133°23'E, 20 Feb 1991, *J. Russell-Smith* 8435 & *Brock* (holo: DNA).

Plants suffrutescent, rarely shrubby, 0.1–0.2 (–1.0) m tall, stems prostrate or rarely erect. Bark stringy, brown to orangish. Branchlets sparsely sericeous (with antrorse hairs bending sharply at base) or villous, glands lacking. Leaves opposite, mostly evenly distributed, coriaceous. Petioles 0.5–1.3 mm long, rounded, eglandular. Leaf blades linear, mostly 10–51 mm long, 1–3 mm wide, base cuneate, free from the stem, apex acute, margins revolute, upper surface glabrous to sparsely sericeous, adaxial midvein impressed, lower surface somewhat sericeous to densely villous, glands of lower surface not visible (usually), or visible and about the same size (very rarely), marginal veins of lower surface invisible or indistinct. Peduncles flexible, 27–58 mm long, sparsely antrorsely sericeous to sparsely villous. Bracteoles 2–2.5 mm long, c. 1 mm wide, tips (in flower) not exceeding base of sepal lobes, sparsely sericeous to glabrous, mostly caducous in fruit. Hypanthium densely sericeous. Sepal lobes 1.1–2 mm long, sparsely sericeous, persistent in fruit, mostly ascending and above body of fruit. Petals pink, elliptic to ovate, 5–7 mm long, upper surface mostly glabrous, lower surface sericeous to sparsely villous. Stamens 3–3.5 mm long; anther connectives glandular. Style 2.5–3 mm long, flexuous or mostly straight, sparsely sericeous. Fruit fusiform, base tapered, 8.5–11 mm long, 3.5–4 mm wide, sparsely sericeous to sparsely tomentose, glabrescent, yellow-green or olive-green. Embryos not seen. Fig. 6O–U.

Selected specimens: Northern Territory. DARWIN AND GULF REGION: Kakadu N.P., Birdie Creek, 13°57'S, 132°52'E, Apr 1990, *Cowie* 1109 & *Leach* (BRI, DNA,

MEL); Head of gorge between Twin Falls and Jim Jim Falls, 13°19'S, 132°59'E, Mar 1984, *Craven* 8248 & *Wightman* (AD, CANB, DNA, MEL); c. 10 km NNE of Jabiru, 12°34'23"S, 132°59'16"E, *Egan* 4849 (CANB, DNA); Kakadu N.P., 10 km NE Jabiru, 12°34'02"S, 132°59'02"E, Apr 1995, *Russell-Smith* 10481 (DNA); 6 km ESE of Twin Falls, 13°22'S, 132°48'E, May 1980, *Craven* 5837 (CANB, DNA); 1 km upstream from Twin Falls, 13°20'S, 132°47'E, Mar 1988, *Fensham* 775 (DNA); 14.5 km NE of Jabiru East, 12°33.5'S, 132°59'E, May 1980, *Craven* 5966 (CANB, DNA).

Distribution and habitat: Northern Territory, Darwin and Gulf Region. In heaths or eucalypt woodlands of sandstone escarpments, in sandy or skeletal soils.

Phenology: Flowering March to April; fruiting known only from April.

Notes: The linear leaves and fusiform fruits are distinctive for the species; the sparsely sericeous midvein on the undersurface of the leaf and the densely sericeous peduncles are also reliable diagnostic characters. The fruits are often irregularly swollen near the midpoint, but this feature can also occur in *L. dunlopii*. Embryo characters have not been seen in the fruits sampled. The species was not seen in the field.

Conservation status: Few populations of this species are known and it is considered vulnerable (criterion D1).

Etymology: The specific epithet is derived from Latin and refers to the linear leaves of the species.

8. *Lithomyrtus microphylla* (Benth.) N. Snow & Guymer comb. nov.

Fenzlia obtusa var. *microphylla* Benth., Fl. Austr. 3: 279 (1866); *Fenzlia microphylla* (Benth.) Domin, Biblioth. Bot. 89: 476 (1928); *Myrtella microphylla* (Benth.) A. J. Scott, Kew Bull. 33: 301 (1978). **Type:** Australia. QUEENSLAND: Dividing range between the rivers Thomson and Burdekin, *J. Sutherland* s.n. (holo: K).

Erect or prostrate shrubs 0.3–1.5 m tall. Bark smooth, or stringy, brown, grey or orangish. Branchlets villous to tomentose, oil glands lacking. Leaves opposite or occasionally whorled, mostly evenly distributed, coriaceous. Petioles 0.8–1.6 mm long, rounded, eglandular.

Leaf blades narrowly elliptic to ovate, 8–30(–42) mm long, 1.7–2(–4.2) mm wide, the base truncate or cuneate, free from the stem, apex obtuse to acute, margins revolute or flat, upper surface glabrescent to sparsely tomentose, adaxial midvein impressed, lower surface tomentose, oil glands of lower surface usually not visible, marginal veins of lower surface invisible or indistinct. Peduncles rigid, 3–10 mm long, villous to tomentose. Bracteoles 2.5–3.2 mm long, 0.4–0.6 mm wide, tips (in flower) not exceeding base of sepal lobes, villous to tomentose, persistent or caducous in fruit. Hypanthium densely villous to tomentose. Sepal lobes 1.4–2.4 mm long, apex acute to acuminate, glabrous to villous (above), or villous to tomentose (below), persistent in fruit, mostly appressed towards body of fruit. Petals white to magenta, elliptic to obovate, 4–4.7 mm long, upper surface glabrous to sparsely sericeous, lower surface sparsely villous to villous. Stamens 2.5–4 mm long; anther connectives eglandular or glandular. Style 3–4 mm long, flexuous, sparsely sericeous. Stigma apex terete or occasionally capitate. Fruit subcylindrical, base tapered, 5–8.4 mm long, 2.5–4.5 mm wide, glabrescent to sparsely tomentose, yellow-green or olive-green. Radicle tip not spirally contorted, held at same horizontal plane as embryo. Fig. 7A–G.

Selected specimens: **Queensland.** BURKE DISTRICT: BURRA Range, 2.5 km from the Great Divide Crest along Flinders Hwy towards Torrens Creek, 20°44'S, 145°13'E, May 1991, *Telford* 11451 (CANB); 102 km N of Hughenden, on road to Lynd Junction, Poison Creek, 19°56'S, 144°16'E, May 1990, *Halford* Q248 (AD, BRI, DNA); Torrens Creek, Mar 1933, *White* 8723 (BRI); "Warang" Holding, White Mountains, c. 37 km NNW of Torrens Creek township, 20°29'S, 144°48'E, Jul 1988, *Fell* DF1292 & *Swain* (BRI); COOK DISTRICT: 74 km from the Chillagoe-Wrotham Park road towards Bulimba, 16°58'S, 143°43'E, Jan 1993, *Bean* 5656 & *Forster* (BRI); 87 km along road to Bulimba Station, off Chillagoe to Wrotham Park road, 16°54'S, 143°36'E, Feb 1994, *Forster* PIF14743 (BRI, DNA, MEL); Mopata H-W boundary on SWER Line to Robinhood, 18°49'S, 143°48'E, Sep 1994, *Godwin* MG4178C (BRI); Poison Creek, 87 miles N of Hughenden, Sep 1937, *Brass* & *White* 68 (BRI). MITCHELL DISTRICT: Barcaldine Shire; Busthinia Quarry, c. 43 km E of Barcaldine, 23°34'S, 145°43'E, *Anderson* 3730 (BRI); 17 km E of Torrens Creek, North Queensland, Mitchell District, 20°44'S, 145°11'E, Jul 1975, *Chapman* 1359 (BRI, CANB, PERTH); N side of Flinders Highway, 140 km of Charters Towers, 20°44'S, 145°11'E, *Jobson* 1804 (BRI, MEL.); 41 km NW of Torrens Creek, 20°26'32"S, 144°50'05"E, Apr 1993, *Thompson*

HUG413 et al. (BRI); "Fleetwood" Station, Aramac, Aug. 1962, *Cockburn* s.n. (BRI). NORTH KENNEDY DISTRICT: Burra Range, 4 km from Great Divide Crest towards Pentland along Flinders Hwy, 20°41'S, 145°14'E, May 1991, *Telford* 11430 & *Rudd* (CANB); Beside Greenvale-Charter Towers road, 32.3 km from Greenvale, 19°07'S, 145°20'E, Jun 1989, *Bean* 1069, (BRI); 5 km SW of "Milray", 20°43'S, 145°41'E, Nov 1991, *Thompson* 392 and *Robins* (BRI); 7.5 km SSE of Mt. Cooper HS, 20°35'S, 146°48'E, Jun 1992, *Thompson* CHA18 & *Sharpe* (BRI); 8 miles W of Pentland, Jun 1953, *Perry* 3553 (BRI, DNA, MEL, PERTH). SOUTH KENNEDY DISTRICT: 19.7 km W of Oxenhope outstation, at Charlies Creek crossing, 21°07'S, 145°30'E, May 1991, *Neldner* 3190 & *Thompson* (AD, BRI); c. 21 km NNW of Yarrowmere Station homestead on Great Dividing Range, 21°17'S, 145°48'E, Oct 1983, *Henderson* H2856 et al. (BRI, CANB); c. 22.5 km NNW of Yarrowmere Station homestead on the Great Dividing Range, 21°16'S, 145°49'E, Oct 1983, *Henderson* H2846 et al. (BRI, CANB); c. 4 km N of the homestead, on Moonoomoo Station, 21°46'S, 145°05'E, Oct 1983, *Henderson* H2776 et al. (BRI); c. 22 km NE of Mirtina Station homestead on S side-road to the Charters Towers to Clermont road, 21°12'S, 146°12'E, Oct 1983, *Henderson* H2903 et al. (BRI).

Distribution and habitat: Queensland: Cook, Burke, North Kennedy, South Kennedy, and Mitchell Pastoral Districts. In open forests, shrublands and heaths, on ridgetops, in sandy or gravelly soils; elevation from 170 to 500 metres.

Phenology: Flowering February to November; fruiting March to November.

Notes: A few specimens of *L. microphylla* with longer than average leaves occasionally have a few oil glands faintly visible on the lower leaf surface. Some specimens (*Bean* 5656; *Forster* PIF14743) have three leaves per node.

Conservation status: Often common to abundant locally.

9. *Lithomyrtus obtusa* (Endl.) N.Snow & Guymer comb. nov.

Fenzlia obtusa Endl., Ataka Bot.: 19, t. 17 (1834); *Myrtella obtusa* (Endl.) A. J. Scott, Kew Bull. 33: 300 (1978). **Type:** Australia: QUEENSLAND: Port Curtis Pastoral District: Between Curtis and Facing Islands, *F. L. Bauer* s.n. (holo: W; iso: K [photo BRI]).

Erect shrubs 0.3–2.5 m tall. Bark smooth or stringy, brown or grey. Branchlets tomentose,

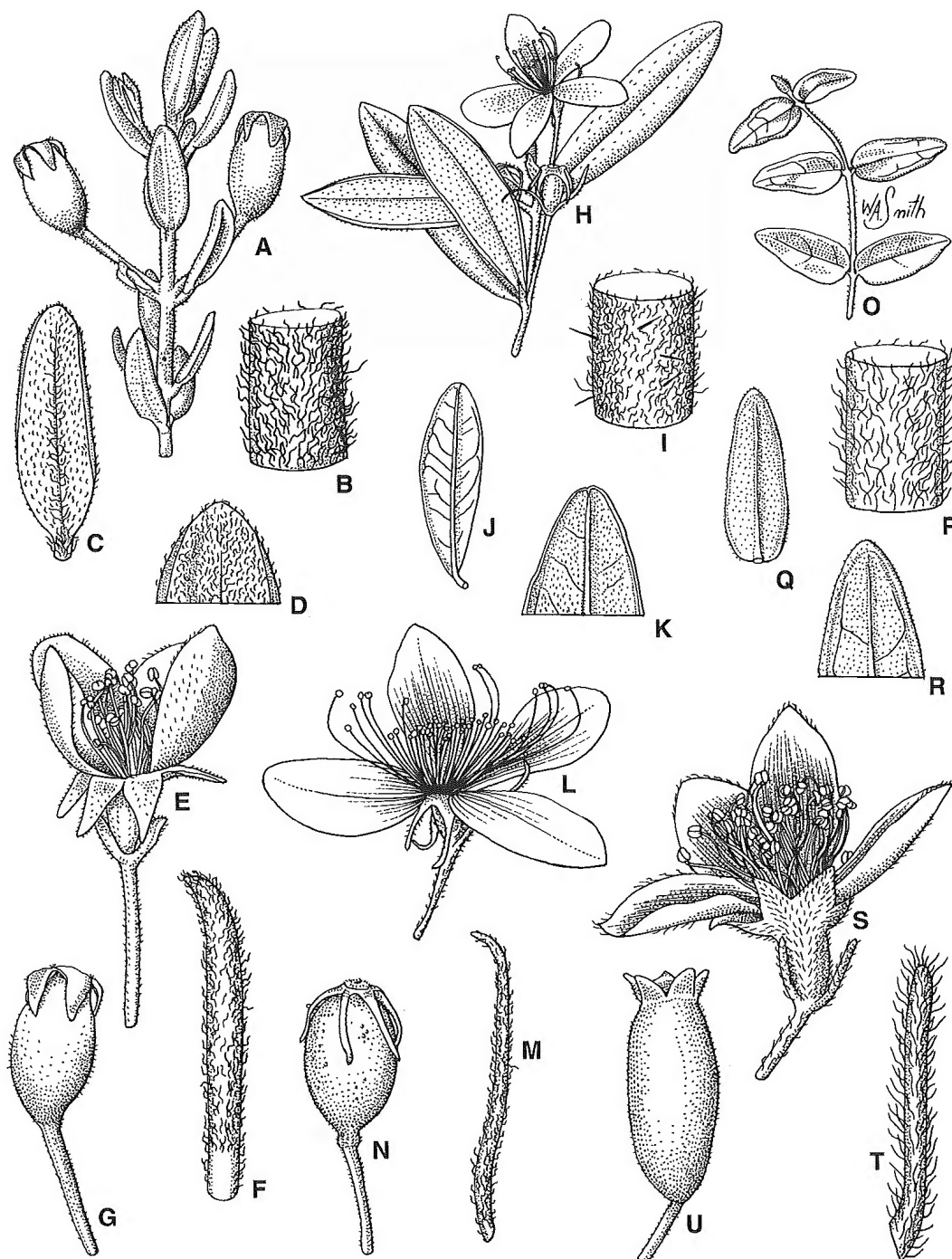


Figure 7. A–G: *Lithomyrtus microphylla*. A. fruiting branchlet $\times 2$. B. section of branchlet $\times 16$. C. adaxial leaf profile $\times 4$. D. adaxial leaf apex $\times 8$. E. flower $\times 4$. F. bracteole $\times 16$. G. fruit $\times 3$. A–D, G: Forster PIF16665 (BRI). E–F: Bean 5758 (BRI). H–N: *L. obtusa*. H. flowering branchlet $\times 1.5$. I. section of branchlet (hairs and fungal bodies) $\times 16$. J. adaxial leaf profile $\times 1$. K. adaxial leaf apex $\times 2$. L. flower $\times 3$. M. bracteole $\times 8$. N. fruit $\times 3$. H–M: Bailey s.n. (BRI AQ 040624). N: White 10126 (BRI). O–U: *L. repens*. O. branchlet $\times 0.5$. P. section of branchlet $\times 12$. Q. adaxial leaf profile $\times 1$. R. adaxial leaf apex $\times 2$. S. flower $\times 4$. T. bracteole $\times 16$. U. fruit $\times 3$. O: Mangion 218 (DNA). P–R, U: Snow 7425 et al. (BRI). S, T: Dunlop & Byrnes 2109 (DNA).

oil glands lacking. Leaves opposite, concentrated near branch tips or evenly distributed, coriaceous. Petioles 1–3 mm long, channelled, eglandular. Leaf blades narrowly elliptic to ovate, or obovate, 15–42 mm long, (4–)7–13 mm wide, base cuneate, free from the stem, apex obtuse or retuse, margins revolute or flat, upper surface glabrous, glabrescent or sparsely short-villous, adaxial midvein impressed, lower surface tomentose, oil glands of lower surface not visible, marginal veins of lower surface mostly invisible or indistinct. Peduncles rigid, 3–8 mm long in flower, 5–14 mm long in fruit, villous to tomentose. Bracteoles 4–9 mm long, 0.4–0.6 mm wide, tips (in flower) exceeding base of sepal lobes, sometimes considerably so, villous to densely villous, caducous in fruit. Hypanthium tomentose. Sepal lobes 2.5–4 mm long, apex acuminate, glabrous (above) or tomentose (below), persistent in fruit, mostly reflexed towards body of fruit. Petals pink, ovate to obovate, 6–9 mm long, upper surface glabrescent, lower surface glabrous to sparsely villous. Stamens 4–7 mm long; anther connectives glandular. Style 5–6 mm long, mostly straight, sparsely sericeous. Fruit globose to subcylindrical, sometimes slightly tapered above, base slightly tapered, 5–9 mm long, 3.5–5 mm wide, glabrescent to sparsely villous, yellow-green or olive-green to dark bluish-black (rarely reddish). Radicle tip not spirally contorted above or below horizontal plane of embryo. Fig. 7H–N.

Selected specimens: Queensland. COOK DISTRICT: Endeavor River, near Marton, 15°28'S, 145°11'E, May 1991, *Dunlop* 7932 & *Clarkson* (BRI, CANB, DNA); E of Escape River, Old Comalco campsite near lake, W of Sadd Point, c. 11°03'S, 142°45'E, Aug 1978, *Kanis* 2073 (BRI, CANB); Between Half Moon Creek and Earl Hill near Cairns, 16°48'S, 145°42'E, Oct 1979, *Batianoff* 1306 & *McDonald* (BRI); Mt. Saunders, near Cooktown, 15°25'S, 145°14'E, Mar 1984, *Scarth-Johnson* 1439A (BRI); Wangetti Beach, Cook Hwy, 16°40'S, 145°34'E, Sep 1992, *Gray* 5556 (QRS); Fitzroy Island, near Cairns, 16°56'S, 146°00'E, May 1968, *Berry* 14942 (QRS); Road to Cape Flattery, c. 0.5 km W of beach, 15°07'S, 145°13'E, Jun 1992, *LeCussan* 98 (QRS); 5 miles N of crossing on Massey Creek on road between Silver Plains Station and Rocky River, c. 13°50'S, 143°29'E, Oct 1969, *Webb & Tracey* 9732 (BRI); Cape York, 100 metres from the tip, 10°40'S, 142°35'E, Aug 1986, *Archer* s.n. (DNA); Headland between Narau and Nanthau beaches, Newcastle Bay, 10°47'S, 142°35'E, Feb 1990, *Forster* PIF6359 (BRI, DNA); Mt. Tozer summit area, Iron Range

N.P., 12°45'S, 143°12'E, Jul 1994, *Forster* PIF15428 (BRI); Coastal Cliffs above Captain Billy Beach, 11°38'S, 142°51'E, May 1980, *Morton* 636 (BRI, MEL); 8.5 km N of the Lockhart River Road on the track to Wattle Hill, 12°41'S, 143°05'S, Aug 1991, *Clarkson* 9077 & *Neldner* (BRI, DNA); 3.8 km E of Garraway Creek on road to Portland Roads, 12°44'S, 143°12'E, Jul 1991, *Neldner* 3533 & *Clarkson* (BRI, DNA); Finch Bay, Mar 1966, *Smith* 13102 (BRI, CANB); Cooktown, mouth of Endeavour River, north bank, 15°28'S, 145°15'E, May 1970, *Blake* 23297 (MEL, PERTH); Moa Island, Torres Strait, 10°11'S, 142°16'E, May 1953, *Marks & Mackerras* s.n. (BRI); 15.1 km S of beachfront at Bathurst Bay on track to "Wakooka", Jul 1984, *Puttock & King* UNSW16751 (BRI, MEL); Cairns, semi-shade on edge of swamp, Apr 1967, *Brass* 33539 (BRI); 2.5 km N of the mouth of the McIvor River, 15°07'S, 145°14'E, Feb 1984, *Clarkson* 5163 (BRI, MEL); Sharp Point, 10°57'S, 142°43'E, Jun 1978, *Clarkson* 2104 (BRI); NORTH KENNEDY DISTRICT: Forrest Beach, c. 12 miles E of Ingham, May 1970, *Fagg* 721 (AD, CANB); Hinchinbrook Island, N end of Ramsay Bay, 18°46'S, 146°18'E, Jul 1988, *Thompson* 915 (CANB); SOUTH KENNEDY DISTRICT: Shaw Island, 20°29'S, 149°09'E, Nov 1985, *Batianoff* 3212 & *Dalliston* (BRI, CANB). PORT CURTIS DISTRICT: Clinton Lowland, Shoalwater Bay area, 22°35'S, 150°42'E, Feb 1992, *Thompson* 73 (BRI); Upper reaches of Leeks Creek, Great Keppel Island, 23°10'S, 150°57'E, Nov 1987, *Batianoff* 9467 & *Dillewaard* (BRI); Port 1, between Curtis and Facing Islands, Aug 1802, *R. Brown* "no. 14 spec." (BRI); South Percy Island, NW of Onslow Point, 21°45'E, 150°20'E, Oct 1989, *Batianoff* 11470 et al. (BRI); Nine Mile Beach, 2–2.5 km NW of Waterpark Point, 22°55'S, 150°47'E, Jul 1977, *Batianoff* 485 & *McDonald* (BRI); Middle Percy Island, 87 miles SE of Mackay, Apr 1956, *Lazarides* 5625 (AD, BRI, DNA, MEL, PERTH); Port Curtis (Port 1), between Curtis and Facing Island, Aug 1802, *R. Brown* s.n. (CANB); "Green Horizons" property of A. Geckeler, 8.4 km from Rules Beach Rd along Fingerfield Rd, c. 60 km direct line NW of Bundaberg, 24°26'S, 151°59'E, Oct 1992, *Geckeler* et al. 9 (CANB).

Distribution and habitat: Queensland: Cook, North Kennedy, Port Curtis, and South Kennedy Pastoral Districts. In heaths, woodlands, shrublands, open forests and vineforest, in sandy soils; altitude from sea level to c. 120 metres.

Phenology: Flowering January to September; fruiting throughout the year.

Notes: The leaves and fruits of this species are sometimes reported to be reddish. A few specimens have oil glands slightly visible on the petioles and abaxial leaf surface (*Marks & Mackerras* s.n., BRI; *Pedley* 2730, BRI; *Forster* PIF5337, DNA). Possible hybrids with *L. retusa* include *Pedley* 2730 and *Gray* 6126 (QRS). The black hair-like structures often visible on the

leaves and stems represent an ophiostomoid fungal infection (J. Simpson, pers. comm., the longer, straight projections in Fig. 7i).

Details from Scott (1978) regarding the type appear to be correct, except for our replacement of "east coast" with more detailed locality information (Burbidge, 1955; see also Burbidge manuscript "An index to the microfilm of Robert Brown's botanical descriptions (manuscript) of Australian plants held at the British Museum (Natural History) at the British Museum" [copies at BRI, CANB]).

Conservation status: Common throughout much of its range.

Local name: "aringi" (Brass 18650, BRI).

10. *Lithomyrtus repens* N.Snow & Guymer **sp. nov.** Plantae procumbentes. Folia anguste ovata usque ovata, basi truncata vel cordata, non amplexicaulia; pagina inferior foliorum dense hirsuta, glandibus nullis autem venis secundariis lateralibus saepe praesentibus. Pedunculi folia plerumque longiores. Fructus subcylindrici usque cylindrici, glabrescentes usque sparse villosi. **Type:** Australia. Northern Territory. DARWIN AND GULF REGION: Arnhem Land, Upper Catchment of East Alligator River, 12°47'31.3"S, 133°21'51.8"E, 12 May 1997, N.Snow 7425 et al. (holo: DNA; iso: BRI, CANB, K, L, MEL, MO, NSW, US).

Plants suffrutescent, 0.2–0.4 m tall, stems prostrate. Bark stringy, orangish. Branchlets villous to tomentose, oil glands lacking. Leaves opposite, mostly evenly distributed, coriaceous. Petioles 1.3–1.7 mm long, rounded or channelled, eglandular. Leaf blades narrowly ovate to ovate, 14–45 mm long, 7–13(–22) mm wide, base truncate or cordate, free from or occasionally clasping the stem, apex obtuse or acute, margins revolute or flat, upper surface glabrous, glabrescent or sparsely short villous, adaxial midvein impressed, lower surface tomentose, oil glands of lower surface visible, marginal veins of lower surface prominent, or invisible or indistinct. Peduncles rigid or flexible, 10–55 mm long, sparsely villous to villous. Bracteoles 1.8–3.1 mm long, 0.2–0.5

mm wide, tips (in flower) not exceeding base of sepal lobes, villous, persistent or caducous in fruit. Hypanthium densely villous to tomentose. Sepal lobes 1–2 mm long, apex acute, villous to tomentose, persistent in fruit, mostly reflexed towards body of fruit. Petals pink to magenta, elliptic to obovate, 5–7 mm long, upper surface glabrous, lower surface villous. Stamens 3.5–5 mm long anther connectives eglandular. Style 4–5.5 mm long, mostly straight, glabrous. Fruit subcylindrical to cylindrical, base tapered, 7.5–10 mm long, 4–5 mm wide, glabrescent to sparsely villous, or villous, yellow-green or olive-green. Radicle tip somewhat spirally contorted above or below plane of embryo. Fig. 7O–U.

Selected specimens: Northern Territory. DARWIN AND GULF REGION: East Alligator River, 12°40'S, 133°15'E, Mar 1973, *Dunlop* 3409 (MEL); Arnhem Land, Upper East Alligator River catchment, 12°49'40.1"S, 133°21'47.2"E, May 1997, *Snow* 7427–a (BRI, DNA, CANB); Headwaters E Alligator River, 12°47'17"S, 133°21'61"E, May 1997, *Guymer* 2504 et al. (BRI, DNA, L, MO, NSW); Arnhem Land, Magela Creek upper catchment, 12°49'19"S, 133°00'25"E, Apr 1995, *Cowie* 5606 & *Brennan* (DNA); Kakadu N.P., Upper Koolpin Creek, 13°27'S, 132°39'E, Jun 1988, *Russell-Smith* 5496 & *Lucas* (BRI, DNA); Kakadu N.P., 8 km NNE of Mt. Evelyn, 13°32'S, 132°56'E, *Menkhorst* 341 (DNA, MEL); 13 km SSW of Twin Falls, 13°25.5'S, 132°44'E, May 1980, *Craven* 5897 (DNA); Near Mt. Gilruth, 13°10'S, 133°06'E, Mar 1984, *Craven* & *Wightman* 8290 (CANB, MEL); Kakadu N.P., Deaf Adder Creek Gorge, 13°07'S, 132°56'E, Apr 1980, *Telford* 7994 & *Wrigley* (CANB); 13 km SSW of Twin Falls, 13°25.5'S, 132°44'E, May 1980, *Craven* 5897 (CANB); 41 miles NE of Pine Creek, Mar 1971, *Dunlop* & *Byrnes* 2109 (DNA); Above U.D.P. Falls, May 1975, *Gittins* 2863 (BRI, DNA); Katherine Gorge N.P., May 1968, *Byrnes* 870 (BRI, DNA, MEL, PERTH); Kakadu N.P., c. 25 km NE of Jabiru, 12°30'24.9"S, 132°57'05.5"E, May 1997, *Snow* 7435 et al. (BRI, DNA); Magela Creek, 12°40'S, 133°03'E, Feb 1973, *Dunlop* 3377 (DNA); Upper Magela Creek Valley, Arnhem Land, 12°45'S, 133°05'E, May 1991, *Russell-Smith* 8470 & *Brock* (DNA); Kakadu N.P., Mt. Brockman area, 12°48'S, 132°54'E, Mar 1995, *Russell-Smith* 10221 (DNA); Kakadu Nat. Park, Dinner Creek, 13°38'18"S, 132°36'18"E, Apr 1995, *Leach* 4396 & *Greschke* (DNA); Headwaters Katherine River, 13°46'06"S, 133°09'03"E, Jul 1996, *Mangion* 218 (DNA); Upper East Alligator, Arnhem Escarpment, 12°46'45"S, 133°22'04"E, Jun 1996, *Michell* 299 & *Knox* (DNA); Kakadu N.P., 10.5 km NE of Mt. Evelyn, 13°31'S, 132°57'E, Apr 1990, *Slee* & *Craven* 2592 (CANB, MEL).

Distribution and habitat: Northern Territory, Darwin and Gulf Region. Amongst rocks on sandstone escarpments in open heaths; soils sandy or skeletal.

Phenology: Flowering February to May; fruiting March to June.

Notes: *Lithomyrtus repens* can resemble *L. hypoleuca* in overall morphology (e.g., *Slee & Craven* 2592), but its prostrate habit and more sparsely pubescent and usually longer peduncles distinguish it from the latter.

Conservation status: The relatively small geographical range and small size of subpopulations (Snow, pers. obs.) suggest *L. repens* is a vulnerable species (criterion D1).

Etymology: The specific epithet is from Latin *repens*, creeping or prostrate, a reference to the habit of the species.

11. *Lithomyrtus retusa* (Endl.) N.Snow & Guymer comb. nov.

Fenzlia retusa Endl., Ataka Bot. 20, t. 18(1834); *Myrtella retusa* (Endl.) A. J. Scott, Kew Bull. 33: 300 (1978). **Type:** Australia, *F. L. Bauer* (lecto: here designated, W, illustration) (fide also Scott 1978).

Fenzlia phebaloides W. Fitzg., J. & Proc. Roy. Soc. Western Australia 3: 189 (1918); *Myrtella phebaloides* (W. Fitzg.) A.J. Scott, Kew Bull. 33: 301 (1978). **Type:** Australia. Western Australia: Tabletop Mountain, Synnot Range, Aug 1905, *W.V. Fitzgerald* 1350 (holo: PERTH).

Shrubs or rarely small trees, 1–3(–5) m tall. Bark smooth or stringy, brown or grey. Branchlets tomentose, oil glands visible and prominent. Leaves opposite, concentrated near branch tips or evenly distributed, coriaceous. Petioles 2–3 mm long, channelled, glandular. Leaf blades narrowly elliptic to elliptic, or obovate (narrowly so), 10–41 mm long, 1–9 mm wide, base cuneate, free from the stem, apex obtuse retuse or rarely acute, margins revolute or flat, upper surface sparsely short-villous to glabrescent, adaxial midvein impressed, lower surface densely tomentose, oil glands of lower surface visible and of differing sizes, marginal veins of lower surface invisible or indistinct. Peduncles rigid, 4–7 mm long, sparsely villous

to tomentose. Bracteoles (0.5–)1–2(–3) mm long, 0.2–0.5 mm wide, ascending but not flexuous, the tips (in flower) not exceeding base of sepal lobes, villous to tomentose, caducous in fruit. Hypanthium tomentose. Sepal lobes 1–1.5 mm long, apex acute, glabrous to sparsely villous, persistent in fruit, mostly reflexed towards body of fruit. Petals pink, elliptic to obovate, 3–6 mm long, upper surface glabrous to glabrescent, lower surface sericeous to sparsely villous. Stamens 3–4 mm long; anther connectives glandular with usually 2 or more oil glands. Style 4–5 mm long, flexuous, sparsely sericeous. Fruit globose or subglobose, base rounded, 3–6 mm long, 4–4.5 mm wide, glabrous to sparsely villous, yellow-green or olive-green to dark bluish-black. Radicle tip somewhat spirally contorted above or below plane of embryo. Fig. 8A–G.

Selected specimens: **Western Australia.** 54.5 km N of Broome on Pt Columbo track, Dampier Peninsula, SW Kimberley, 17°36'S, 122°11'E, Jun 1981, *Kenneally* 7584 (BRI, MEL); Forest Creek, near Drysdale River, 14°39'S, 126°57'E, Aug 1975, *George* 14114 (CANB, PERTH); King Edward River, c. 50 km NE of Mitchell River H.S., Aug 1978, *Beaglehole* 59127 & *Errey* 2853 (CANB, PERTH). **Northern Territory.** DARWIN AND GULF REGION: c. 6 miles N of Pine Creek Township, 13°48'S, 131°50'E, Mar 1965, *Lazarides & Adams* 148 (DNA, MEL); Arnhem Land, near Murganella Settlement, west of Workshop Road, 11°32'48.3"S, 132°55'25.3"E, May 1997, *Snow* 7413 & *Mangion* (BRI, CANB, DNA, K, L, MO, NSW); Near Raft Point, 20 km from Mandorah Road, 12°38'S, 130°34'E, Feb 1991, *Cowie* 1491 & *Dunlop* (BRI, CANB, DNA, MEL, PERTH); Gulf of Carpentaria, Maria Island, 14°54'S, 135°41'S, Jul 1972, *Dunlop* 2946 (BRI, DNA, MEL); Wigram Island, 11°45'S, 136°37'E, Jul 1992, *Leach* 3058 (BRI, CANB, DNA); Darwin River, near bridge, 12°42'S, 130°54'E, Feb 1977, *Parker* 705 (CANB, DNA); Headwaters of Waterfall Creek, 13°24'44"S, 132°29'23"E, Apr 1995, *Leach* 4387 & *Greshke* (CANB, DNA); Katherine Gorge N.P., 14°14'S, 132°29'E, Jun 1982, *Siversten* 667 (DNA); Goyder River, 13°01'S, 134°59'E, *Dunlop* 8687 & *White* (CANB, DNA, MEL); Bathurst Island, 8 km E of Nguiu, 11°48'S, 130°30'E, Apr 1987, *Wightman* 3550 & *Smith* (CANB, DNA); Astell Island, N end, 11°51'52"S, 136°24'31"E, Apr 1996, *Cowie* 6585 (DNA); Groote Eylandt, headwaters of Amakula River, 14°06'S, 136°33'E, Sep 1991, *Cowie* 2036 & *Brocklehurst* (CANB, DNA, MEL); Black Islet, Sir Edward Pellew Group, 15°36'S, 136°40'E, Jul 1988, *Thomson* 2573 (DNA); Melville Island, 11°42'S, 130°50'E, Jan 1992, *Leach* 2955 & *Cowie* (CANB, DNA, MEL); Near Doyndgji, E Arnhem Land, 12°55'00"S, 135°24'00"E, Oct 1976, *Scarlett* 45 (DNA). **Queensland.** COOK DISTRICT: Iron Range Road, c. 2 km upstream [from] creek crossing Cape Weymouth, 12°46'S, 143°07'E, Apr 1988,

Forster PIF4177 & *Liddle* (BRI, CANB); Agate Creek, Robinhood Station, SW of Forsayth, 18°50'S, 143°25'E, Apr 1996, *Forster* PIF19080 et al. (BRI); Moa Island, 10°11'S, 142°16'E, *Budworth* 319 (BRI); McDonald Creek area, 42 km from Mt Surprise township, Mt Surprise gemfields, 18°03'S, 144°07'E, Apr 1985, *Champion* 132 (BRI); 19.8 km from Oroners on the track to New Dixie, 15°21'S, 143°09'E, Jun 1981, *Clarkson* 3762 (BRI); c. 24 km SSE of the mouth of the Olive River, c. 3 km S of Mosquito Point, 12°22'S, 143°10'E, Apr 1993, *Clarkson* 9997 & *Neldner* (BRI); 74 km from the Chillagoe – "Wrotham Park" road towards "Bulimba", 16°58'S, 143°44'E, Jan 1993, *Bean* 5658 & *Forster* (BRI, DNA); 20 km NW of Mount Garnet, on road to Lappa, 17°36'S, 144°59'E, Jan 1993, *Bean* 5488 & *Forster* (BRI); 5 km N of Fairlight on the Palmerville road, 15°42'S, 144°03'E, Jun 1992, *Clarkson* 9610 & *Neldner* (BRI).

Distribution and habitat: Western Australia; Northern Territory, Darwin and Gulf Region; Queensland, Cook District. In *Eucalyptus* woodlands; on sandstone escarpments, occasionally along streambanks, in sandy and skeletal soils.

Phenology: Flowering December to June; fruiting December to September.

Notes: *Lithomyrtus retusa* has the most variation in leaf characters of all species of *Lithomyrtus*. Plants are covered with oil glands nearly throughout, including the upper leaf surfaces where the glands are sometimes dark and prominent. The foliage hairs can appear ferruginous on close inspection (*Snow et al.* 7413; *Bean* 5665 & *Forster*, BRI). A few specimens have the bracteoles exceeding the base of the sepal lobes in length (*Bean* 5658 & *Forster*, BRI; *Bean* 5665 & *Forster*, BRI).

Conservation: Widespread and locally common.

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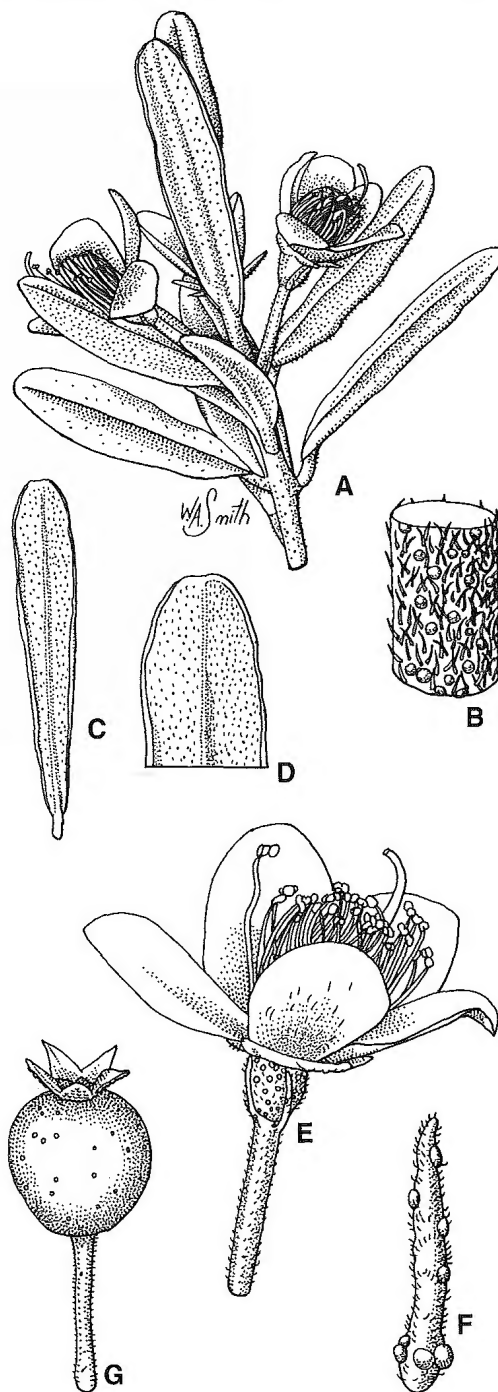


Figure 8. A–G: *Lithomyrtus retusa*. A. flowering branchlet $\times 3$. B. section of branchlet $\times 2$. C. adaxial leaf profile $\times 2$. D. adaxial leaf apex $\times 4$. E. flower $\times 6$. F. bracteole $\times 24$. G. fruit $\times 4$. A–G: *Snow* 7413 & *Mangion* (BRI).

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Appendix 1. Characters for natural language descriptions for *Lithomyrtus* and *Myrtella* as coded in DELTA (Dallwitz et al., 1993). Some characters invariant for this study are listed, given their likely value in later studies of Myrtaceae.

*Character List

- #1. including <synonyms: genera' included in the future description>/
- #2. plants <growth form>/
 1. suffrutescent/
 2. shrubby/
 3. tree-like shrubs/
 4. small trees/
- #3. plants <main> stems <habit>/
 1. erect/
 2. prostrate/
- #4. plant height/
 1. m tall/
- #5. bark <texture>/
 1. smooth/
 2. stringy/
- #6. bark <colour>/
 1. brown/
 2. grey/
 3. orangish/
- #7. branchlets <whether four-angled>/
 1. distinctly four-angled/
 2. rounded/
- #8. branchlets <whether winged>/
 1. with distinctly winged edges/
 2. not winged/
- #9. branchlets <vestiture >/
 1. glabrous/
 2. sparsely sericeous/
 3. villous/
 4. tomentose/
- #10. branchlets oil glands <whether visible and prominent or not visible>/
 1. visible and prominent/
 2. absent/
- #11. leaves <arrangement between nodes>/
 1. distichous/
 2. decussate/
- #12. leaves <arrangement at nodes>/
 1. opposite/
 2. disjunct opposite/
 3. whorled/
 4. alternate/
- #13. leaves <distribution: whether concentrated near branch tips or more or less evenly distributed>/
 1. mostly concentrated near branch tips/
 2. mostly evenly distributed/
- #14. apex acuminate, leaves <texture: whether coriaceous or soft>/
 1. coriaceous/
 2. soft/
- #15. stipules <type>/
 1. consisting of 2–several short, thick, deep red, often laterally fused scale-like structures/
 2. consisting of 2–several free ferruginous setose hairs/
- #16. petioles <length>/
 1. mm long/
- #17. petioles <whether channelled>/
 1. rounded/
 2. channelled/
- #18. petioles <glandularity>/
 1. eglandular/
 2. glandular/
- #19. leaf blades <shape>/
 1. linear/
 2. narrowly elliptic/
 3. elliptic/
 4. lanceolate/
 5. narrowly ovate/
 6. ovate/
 7. broadly ovate/
 8. obovate/
- #20. leaf blades <length>/
 1. mm long/
- #21. leaf blades <width>/
 1. mm wide/

- #22. leaf blades at base <shape>/
 1. truncate/
 2. cordate/
 3. cuneate/
- #23. leaf blades at base <whether clasping stem>/
 1. free from the stem/
 2. clasping the stem/
- #24. leaf blades at apex <shape>/
 1. obtuse/
 2. acute/
 3. retuse/
- #25. leaf blade margins <whether folded>/
 1. revolute/
 2. flat/
- #26. leaf blades adaxial surface <indumentum>/
 1. glabrous/
 2. glabrescent/
 3. sparsely sericeous/
 4. sericeous on lower portion of midvein/
 5. sparsely tomentose along lower edges/
 6. sparsely short villous/
 7. sparsely tomentose/
 8. tomentose/
- #27. <leaf blades> adaxial midvein/
 1. impressed/
 2. flush/
- #28. leaf blades lower surface <indumentum>/
 1. glabrous/
 2. glabrescent/
 3. somewhat sericeous/
 4. sericeous on lower portion of midvein/
 5. villous/
 6. densely villous/
 7. tomentose/
 8. densely tomentose/
- #29. leaf blade oil glands of lower surface/
 1. absent/
 2. visible and about equal in size/
 3. visible and of differing sizes/
- #30. leaf blade marginal veins of lower surface/
 1. prominent/
 2. absent or indistinct/
- #31. inflorescence <type>/
 1. a solitary flower/
 2. other/
- #32. peduncle <arrangement>/
 1. solitary in leaf axils/
 2. other/
- #33. peduncle <stiffness>/
 1. rigid/
 2. flexible/
- #34. peduncle (in flower) <length>/
 mm long/
- #35. peduncle <pubescence in flower>/
 1. glabrous/
 2. sparsely antrorsely sericeous/
 3. sparsely villous/
 4. villous/
 5. tomentose/
- #36. bracteoles subtending flowers <number>/
 1. two/
 2. other/
- #37. bracteoles <appearance>/
 1. foliaceous and usually with midrib/
 2. scale-like and lacking midrib/
- #38. bracteoles <length>/
 mm long/
- #39. bracteoles <width>/
 mm wide/
- #40. bracteoles <flexuosity>/
 1. ascending and rigid/
 2. irregularly flexuose/
- #41. bracteole tips <length> (in flower)/
 1. exceeding base of sepal lobes/
 2. shorter than base of sepal lobes/
- #42. bracteoles <indumentum>/
 1. glabrous/
 2. minutely and sparsely sericeous along edges/
 3. sparsely sericeous/
 4. villous/
 5. densely villous/
 6. tomentose/
- #43. bracteoles <persistence>/
 1. persistent in fruit/
 2. caducous in fruit/
- #44. hypanthium <shape in flower>/
 1. obconic/
 2. other/
- #45. hypanthium <indumentum>/
 1. glabrous/
 2. densely sericeous/
 3. villous/
 4. densely villous/
 5. tomentose/
 6. densely tomentose/
- #46. sepals <number>/
 1. five/
 2. four/
- #47. sepals <fusion at base>/
 1. fused proximally/
 2. free/
- #48. sepal lobes <fusion>/

1. coherent in mature bud/
2. separate in mature bud/
- #49. sepal lobes apex <shape>/
1. acute/
2. acuminate/
- #50. sepal lobes <length>/
mm long/
- #51. sepal lobes <indumentum>/
1. glabrous/
2. sparsely sericeous/
3. sparsely villous/
4. villous/
5. sparsely short tomentose along edges/
6. sparsely tomentose/
7. tomentose/
- #52. sepal lobes <duration>/
1. persistent in fruit/
2. deciduous in fruit/
- #53. sepal lobes <habit in fruit>/
1. mostly reflexed towards body of fruit/
2. mostly ascending and above body of fruit/
- #54. petals <number>/
1. five/
2. four/
- #55. petals <color>/
1. white/
2. pink/
3. magenta/
- #56. petals <shape>/
1. elliptic/
2. ovate/
3. broadly ovate/
4. obovate/
- #57. petals <length>/
mm long/
- #58. petals – adaxial surface <indumentum>/
1. glabrous/
2. glabrescent/
3. sparsely sericeous/
4. villous/
- #59. petals – abaxial surface <indumentum>/
1. glabrous/
2. sericeous/
3. sparsely villous/
4. villous/
5. tomentose/
6. minutely tomentose on edges/
- #60. stamens <number>/
1. numerous/
2. five/
- #61. stamens <number of whorls>/
1. uniseriate/
2. multiseriate/
- #62. stamens <length relative to petals>/
1. included/
2. exerted/
- #63. stamens <position in bud>/
1. folded centripetally in bud/
2. other/
- #64. stamens <length>/
mm long/
- #65. staminal disk <indumentum>/
1. glabrous/
2. hairy/
- #66. anthers <shape>/
1. rounded/
2. sagittate/
- #67. anthers <attachment to filaments>/
1. dorsifixed/
2. basifixed/
- #68. anthers <length relative to filaments>/
1. less than one fourth length of
filaments/
2. other/
- #69. anthers <dehiscence>/
1. dehiscent via longitudinal slits/
2. other/
- #70. anthers connectives <glandularity>/
1. eglandular/
2. glandular/
- #71. styles <length>/
mm long/
- #72. styles <habit>/
1. flexuous/
2. mostly straight/
- #73. styles <indumentum>/
1. glabrous/
2. sparsely sericeous/
- #74. stigma apex <type>/
1. terete/
2. capitate/
- #75. fruit <dehiscence>/
1. indehiscent/
2. dehiscent/
- #76. fruit <type>/
1. a hard berry with bony, more or less
fused seeds/
2. a soft berry/
- #77. fruit <shape>/

1. subglobose/
 2. globose/
 3. subcylindrical/
 4. cylindrical/
 5. fusiform/
- #78. fruit base <shape>/
1. rounded/
 2. tapered/
- #79. fruit <length>/
- mm long/
- #80. fruit <width>/
- mm wide/
- #81. fruit <pubescence>/
1. glabrous/
 2. glabrescent/
 3. sparsely sericeous/
 4. sparsely villous/
 5. villous/
 6. sparsely tomentose/
 7. tomentose/
 8. densely tomentose/
- #82. fruit <color>/
1. dark bluish-black/
 2. yellow-green or olive-green/
 3. whitish by virtue of dense hairs/
 4. red/
 5. brown/
- #83. peduncle <length>/
- mm long in fruit/
- #84. ovaries <number in fruit>/
- in fruit/
- #85. placentation/
1. parietal/
 2. axile/
- #86. locules/
- per ovary/
- #87. seed coat <texture>/
1. hard, bony/
 2. soft, somewhat pulpy/
- #88. adjacent seeds <relative fusion>/
1. slightly fused, the boundaries in longitudinal section generally distinct and perpendicular to long axis/
 2. tightly fused, the boundaries in longitudinal section generally indistinct and often somewhat oblique to long axis/
- #89. embryo <shape>/
1. falcate to crescent/
 2. circinate/
- #90. embryos <oiliness>/
1. oily/
 2. starchy/
- #91. hypocotyl <length>/
1. relatively short/
 2. relatively long/
- #92. hypocotyl <thickness>/
1. relatively thick/
 2. relatively thin/
- #93. hypocotyl <swelling>/
1. swollen near tip/
 2. not or slightly swollen near tip/
- #94. hypocotyl tip <position relative to plane of embryo>/
1. somewhat spirally contorted above or below plane of embryo/
 2. held at same horizontal plane as embryo/
- #95. cotyledons <curvature>/
1. circinate/
 2. mostly straight/
- #96. cotyledons <length>/
1. relatively short/
 2. relatively long/
- #97. cotyledons <length relative to hypocotyl>/
1. shorter than hypocotyl/
 2. about equalling hypocotyl/
- #98. cotyledons <thickness>/
1. relatively thick/
 2. relatively thin/
- #99. cotyledons <position>/
1. not folded back towards hypocotyl/
 2. folded back towards hypocotyl/
- #100. <geographical range>/
1. Queensland/
 2. Northern Territory/
 3. Western Australia/
 4. Papua New Guinea/
 5. Irian Jaya/
 6. Guam/
- #101. <geographical range in Queensland>/
1. Cook/
 2. Burke/
 3. North Kennedy/
 4. South Kennedy/
 5. Mitchell/
 6. Gregory North/
 7. Port Curtis/
- #102. habitat/
- #103. elevation/
- #104. <taxon name>/

Appendix 2. Enumeration and discussion of characters used in cladistic studies. Numbers in parenthesis following character description correspond to DELTA numbering system (Appendix 1).

1. Stem habit (3): prostrate (0); erect (1). *L. repens* is prostrate and herbarium specimens indicate a prostrate habit for *L. linariifolia*.
2. Young branch cross section (7): quadrangular (0); round (1). The character is most easily observable in young twigs.
3. Young branch wings (8): present (0); absent (1). This character is also most easily observable in young twigs.
4. Oil glands on branchlets (10): absent (0); present (1). Since the presence of oil glands on branchlets does not correlate invariably with the presence of oil glands abaxially on leaves, their expression must have a different genetic basis.
5. Leaf distribution (13): concentrated near branch tips (0); more or less evenly distributed (1). This character is not always easily determined on herbarium specimens. It is pronounced for *L. densifolia*, which has very dense foliage.
6. Leaf texture (14): coriaceous (0); soft (1). This character partially reflects patterns of pubescence on the leaves, and may need modification.
7. Mature leaf bases (23): free from the stem (0); clasping the stem (1). Stem-clasping leaves occur in *L. kakaduensis* and are occasionally present in *L. repens*. Youngest leaves of *L. grandifolia* can be stem-clasping.
8. Stipules (15): short squamose structures that are often fused laterally (0); free short setose hairs (1). The differences in character states are readily apparent on herbarium specimens. The stipules of *Lithomyrtus* resemble those in Fig. 3b of Dahlgren & Thorne (1985); those of *Myrtella* somewhat resemble the stipules in Fig. 3f (op. cit.), but are shorter, broader and fused at the base.
9. Petiolar oil glands (18): absent (0); present (1). Since petiolar oil gland presence is not correlated with glands elsewhere, it is assumed to have a distinct genetic basis.
10. Leaf blade base shape (21): truncate (0); cordate (1); cuneate (2).
11. Abaxial leaf oil glands (29): indistinct (0); visible (1).
12. Marginal adaxial leaf veins (30): absent or indistinct (0); prominent (1).
13. Bracteole type (37): foliaceous with a distinct midrib (0); scale-like and lacking a midrib (1).
14. Bracteole flexuosity (40): ascending and straight (0); flexuose (1).
15. Bracteole length (41): longer than base of sepal lobes (0); shorter than base of sepal lobes (1).
16. Sepal lobe arrangement in bud (48): coherent in mature bud (0); separate in mature bud (1).
17. Sepal lobe apex (49): acute (0); acuminate (1).
18. Sepal lobe position in fruit (53): mostly reflexed against body of fruit (0); mostly above body of fruit (1).
19. Staminal disk vestiture (65): glabrous (0); hairy (1). The staminal disk is the apex of the hypanthium on which stamens are inserted.
20. Anther connectives (70): eglandular (0); glandular (1). *Lithomyrtus retusa* usually has two or more oil glands per anther, which can arise from the connective or anther wall. No quantification of glands was attempted (e.g., Landrum & Bonilla 1996).
21. Fruit base shape (78): rounded (0); tapered (1).
22. Relative fusion of seeds (88): slightly fused, the boundaries in longitudinal section distinct and perpendicular to long axis of fruit (0); tightly fused, the boundaries in l.s. indistinct and often oblique to long axis of fruit (1).
23. Embryo shape (89): slightly curved (0); circinate (1).
24. Hypocotyl length (91): relatively short (0); relatively long (1). The alternative states are very apparent between *Lithomyrtus* and *Myrtella*, although they may be of limited use in Myrtaceae as a whole (see Landrum & Stevenson 1986).
25. Cotyledon length (96): relatively short (0); relatively long (1). The comments for character 24 apply equally here.
26. Cotyledon thickness (92): relatively thick (0); relatively thin (1). The comments for character 24 apply equally here.
27. Hypocotyl tip (94): somewhat spirally contorted above or below plane of embryo (0); held in same plane as embryo (1).

Table 1. Character coding for cladistic analysis (cf Appendices 1 & 2); all characters unweighted and unordered. Taxon numbers follow sequence in manuscript.

Character	Taxon												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	1	1	1	1	1	1	1	0	1	1	0	1
2	0	0	1	1	1	1	1	1	1	1	1	1	1
3	0	0	1	1	1	1	1	1	1	1	1	1	1
4	0	1	0, 1	1	1	1	1	1	1	1	1	1	0
5	1	0, 1	0	1	1	1	0, 1	0, 1	1	1	0, 1	1	0, 1
6	1	0, 1	0	1	1	1	0, 1	0, 1	1	1	0, 1	1	0, 1
7	0	0	0	0	0	0	0	1	0	0	0	0, 1	0
8	0	0	1	1	1	1	1	1	1	1	1	1	1
9	0	0	0, 1	0	0	0	1	0	0	0	0	0	1
10	0	0	0, 1	2	2	2	0, 2	1	2	0, 2	2	0, 1	2
11	1	1	1	1	0	0	0	0	0, 1	0	0, 1	0, 1	1
12	1	1	0, 1	1	1	0	1	0	1	1	1	0, 1	1
13	0	0	1	1	1	1	1	1	1	1	1	1	1
14	1	1	0	0	0	0	0	0	0	0	1	0	0
15	0	0	0, 1	1	0, 1	1	1	1	1	1	0	1	1
16	0	0	1	1	1	1	1	1	1	1	1	1	1
17	1	1	0, 1	1	0, 1	1	0, 1	1	0, 1	0, 1	1	0	0
18	1	1	0	1	1	0	1	1	1	0	0	1	1
19	0	0, 1	0, 1, 2	1, 2	0, 1, 2	1	1	1	1	0, 1, 2	1	1, 2	1
20	0	0	1	1	1	1	1	1	1	1	1	1	1
21	0	1	1	1	1	0	1	1	1	0, 1	1	0	1
22	1	1	0	0, 1	1	0	0	0	1	1	1	1	0
23	0	0	1	1	1	1	1	1	1	1	1	1	1
24	0	0	1	1	1	1	?	1	?	1	1	1	1
25	0	0	1	1	1	1	?	1	?	1	1	1	1
26	0	0	1	1	1	1	?	1	?	1	1	1	1
27	0	0	1	1	1	1	?	1	?	1	1	1	1

***Desmodium* Desv. (Fabaceae) and related genera in Australia: a taxonomic revision**

Les Pedley

Summary

Pedley, Les (1999). *Desmodium* Desv. (Fabaceae) and related genera in Australia: a taxonomic revision. *Austrobaileya* 5(2):209–261. The concepts of Ohashi (1973) are adopted and five genera are recognised for Australia: *Aphyllodium* (DC.) Gagnep. (*Dicerma* DC. *sensu* Benth.), *Dendrolobium* Benth., *Desmodium* Desv., *Phyllodium* Desv. and *Tadehagi* Ohashi. A classification of *Desmodium* in Australia, closely following Ohashi's for Asia, is presented. Taxa described as new are: *Desmodium* subg. *Acanthocladum* (type: *D. acanthocladum* F. Muell.), *Desmodium* ser. *Arillata* (type: *D. microphyllum* (Thunb.) DC.), *Desmodium* ser. *Sagotia* (type: *D. triflorum* (L.) DC.), *Aphyllodium glossocarpum*, *A. latifolium*, *A. parvifolium*, *A. schindleri*, *A. stylosanthoides*, *Dendrolobium multiflorum*, *Desmodium glareosum*, *D. pullenii*, *D. pycnotrichum*, *D. tivense*, *Phyllodium pulchellum* var. *glabrius*, *P. hackeri* and *Tadehagi robustum*. New combinations are *Desmodium* sect. *Desmodiopsis* (based on *Alysicarpus* sect. *Desmodiopsis* Schindl.) *Desmodium* ser. *Stenostachys* (based on *Desmodium* sect. *Stenostachys* Schindl., lectotype *D. filiforme* Zoll. & Moritz), *Dendrolobium cheelii* (based on *Alysicarpus cheelii* C.A. Gardner), *Dendrolobium polyneurum* (based on *Desmodium polyneurum* S.T.Blake), *Dendrolobium umbellatum* var. *hirsutum* (based on *Desmodium umbellatum* var. *hirsutum* DC.) and *Desmodium whitfordii* based on *Desmodium nemorosum* subvar. *whitfordii* Schindl., the last two from the Mascarenes and the Phillipines respectively. Keys to species are provided; new and poorly understood taxa are described and references to descriptions of all others provided; brief notes on distribution and habitat of all species are included; and typification of some species is discussed. Forty-eight Australian species are treated: six *Aphyllodium*, six *Dendrolobium*, 32 *Desmodium*, three *Phyllodium* and one *Tadehagi*.

Key words: *Aphyllodium*, *Dendrolobium*, *Desmodium*, *Dicerma*, *Phyllodium*, *Tadehagi*

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Introduction

This account relies heavily on the work of Ohashi (1973), and may be considered a supplement to it. I have adopted Ohashi's circumscription of genera and, in most cases, of species. Where his descriptions of taxa are satisfactory I have merely referred to them. For species widely spread in the Old World or recently introduced into Australia I have referred to other accounts, especially those of Schubert (1971) and Verdcourt (1979).

Ohashi (1973) discussed at some length the various treatments of *Desmodium sensu lato*. Candolle (1825) recognised a large genus *Desmodium* Desv. and much smaller *Nicolsonia* DC. and *Dicerma* DC. (which included *Phyllodium* Desv.). *Dicerma* is an illegitimate name and has to be replaced by *Aphyllodium* (DC.) Gagnep.; this matter is

discussed below (p.211). Bentham (1852), taking a rather narrow view of genera, described several as new and recognised Candolle's two sections of *Dicerma* as distinct genera, namely *Phyllodium* Desv. and *Dicerma* DC. (for sect. *Aphyllodium*). Later, however, Bentham (1865a) tergiversated; he wrote "In the first general account of the group which I made for the 'Plantae Junghunianae' it appeared to me that if the universally accepted genera *Dicerma* and *Nicolsonia* of De Candolle are maintained, it would be necessary to keep up several others, and even to establish new ones, for which I gave the characters in that work. I have however, since then, had occasion to examine in detail above a hundred species, . . . and the characters relied on for separation of the smaller genera have proved too uncertain or artificial to be available for any but sectional divisions; that in our 'Genera Planarum' I have found it necessary not only to restore the genus to the

extent originally contemplated by De Candolle, but to add to it his *Dicerma* and *Nicolsonia* . . .". He further stated that it was with much hesitation that he refrained from adding to them the small or monotypic genera *Ougeinia* Benth., *Mecopus* Benn. and *Pseudarthria* Wight & Arn. So it was that Bentham (1864, 1865b) and Baker (1879) adopted a broad concept of *Desmodium*. Schindler had different concepts and recognised not only the segregate genera proposed by Candolle (1825) and Bentham (1852) but described several new ones; see Schindler (1928) for details of his numerous papers. Schindler's views were not generally accepted; Fosberg (1966), for example, was forthright in his opposition, noting of *Desmodium* that 'some authors have dismembered this very natural and distinctive genus into a number of ill-distinguished segregate genera. Nothing seems to be gained by accepting these, so they are ignored here'. Knaap-van Meeuwen (1962) and Verdcourt (1979), both of whom dealt with floras of regions where segregate genera occur, also 'kept to the more extended view of *Desmodium*' (Verdcourt 1979). Ohashi (1973) adopted a position between that of Bentham and his followers and Schindler. On the whole Ohashi et al. adopted Ohashi's (1973) treatment, though they discussed the difficulties in arriving at a 'sensible classification' of Desmodieae.

Adopting a 'more extended view of *Desmodium*' has some attraction. Having dealt with Australian and Sri Lankan species which has necessitated a more-than-cursory examination of most of the Old World Desmodiinae I would favour recognition of four genera in Australia, namely *Tadehagi*, *Desmodium*, *Phyllodium*, *Aphyllodium*, with *Dendrolobium* included in *Phyllodium*. However, until further scientific investigation, rather than intuition, informed as it might be, clarifies the situation I am following the classification proposed by Ohashi (1973). Though recorded by Ohashi, *Codariocalyx* does not occur in Australia.

Aphyllodium (DC.) Gagnep., Not. Syst. 3:254 (1916); Pedley, Rev. Handb. Fl. Ceylon 10:106(1996); Ohashi, Taiwania 42: 142(1997); *Dicerma* DC., Prodr. 2:339 (1825), Mém. Leg. 326 (1826), incl. sect. *Aphyllodium* DC. but excl. sect. *Phyllodium* (Desv.) DC.; Wight & Arn., Prodr. Fl. Ind. orient. 238 (1834); Benth. in Miq., Pl. Jungh. 217 & 219 (1852); Schindl., Rep. sp. nov. reg. veg. 20:267 (1924); Hutch., Gen. Fl. Pl. 1:483 (1964); Ohashi, Ginkgoana 1:251 (1973), nom. illeg; *Desmodium* sect. *Dicerma* Benth. in Benth. & J.D. Hook., Gen. Pl. 1:519 (1865); *Desmodium* subg. *Dicerma* Baker in J.D. Hook., Fl. Brit. India 2:163 (1876); **Type:** *Aphyllodium biarticulatum* (L.) Gagnep.

Aphyllodium is the most distinctive and well defined of the segregates of the Linnean *Hedysarum* though Bentham (1865b), followed by later authors, referred it (as *Dicerma*) to *Desmodium*. It has united amplexicaul stipules that are mostly divided to the middle, secondary bracts similar in size and shape to the primary bracts, and deeply constricted 1- or 2- jointed pods with orbicular to transversely elliptic (rarely, in *A. glossocarpum*, oblong) articles.

Ohashi (1973) considered *Aphyllodium* (as *Dicerma*) to be related to *Phyllodium* because of the similarity of their inflorescences. The primary bracts are, however, not homologous with the foliar bracts of *Phyllodium* (q.v.) and the genera are not particularly closely related.

Hitherto *Aphyllodium* has been considered to consist of either three species, one widespread and polymorphic (Schindler 1924, Ohashi 1997b), or one species (Ohashi 1973). This study indicates that there are seven species in Australia and New Guinea, one (*A. biarticulatum*) wide ranging and one (*A. novoguineense* (Schindl.) Ohashi) poorly known and probably misunderstood. The misapplication of the name is discussed briefly below.

Nomenclature

The genus *Phyllodium* was described by Desvaux who included in it two species, *P. pulchellum*, based on *Hedysarum pulchellum* L., and *P. lutescens*, based on *H. lutescens* Poir. His description and illustration were derived solely from *P. pulchellum*, and *P. lutescens* has since been transferred to the monotypic genus *Pycnospora*.

Candolle described the genus *Dicerma*, with two sections: *Aphyllodium*, with one species *Dicerma biarticulatum* (*Hedysarum biarticulatum* L.), and *Phyllodium*, Desvaux's genus *Phyllodium*. He explained (1826) that he wished to retain *Phyllodium* in its original sense and had therefore, in adding another section, coined another generic name. Under the current Code of Botanical Nomenclature, Candolle should have used the existing generic name *Phyllodium* for his enlarged genus and because he did not do so, his generic name *Dicerma* was superfluous and therefore illegitimate.

Bentham (1852) treated the two sections of *Dicerma* DC. as genera for which he used the names *Phyllodium* Desv. and, for sect. *Aphyllodium*, the illegitimate name *Dicerma*. In the next 60 or so years the name *Dicerma* was used at generic, subgeneric and sectional rank. Except for its use as a generic name these

usages do not conflict with the International Code of Botanical Nomenclature.

Gagnepain, without any discussion at all of the standing of the name *Dicerma*, raised *Dicerma* sect. *Aphyllodium* to generic rank as *Aphyllodium* (DC.) Gagnep. and in doing so provided a legitimate name for *Dicerma* as circumscribed by Bentham (1852). Unfortunately Schindler, who sometimes adopted names which are at variance with the present International Code of Botanical Nomenclature, quibbled about Gagnepain's generic distinctions, but agreed using other criteria that *Aphyllodium* (DC.) Gagnep. was indeed distinct and again applied to it the illegitimate name *Dicerma*. Such has been the prestige of Bentham and Schindler (rightly so as taxonomists) that *Aphyllodium* has not been taken up as a generic name. Conservation of the name *Dicerma* for *Dicerma* sect. *Aphyllodium* is not warranted as it has never been applied to more than three species, two of them little known with narrow geographic ranges. I have therefore used the correct name *Aphyllodium* for the Australian species.

A number of infra-specific taxa of *A. biarticulatum* has been described and a knowledge of the circumscription of these taxa and the rather loose application of their names is essential to an understanding of the taxonomy of the genus in Australia. These matters are dealt with in some detail under *A. biarticulatum*.

Key to species

1. Terminal leaflet more than 12 mm wide, more than 30 mm long and 2.2–3.2 times longer than wide 1. ***A. latifolium***
 Terminal leaflet less than 12 mm wide, if more than 30 mm long then either more than 3 times longer than wide or less than 1.5 times longer than wide 2
2. Leaflets to 4 mm long, 1–2 times longer than wide 2. ***A. parvifolium***
 Leaflets more than 10 mm long, more than twice as long as wide 3
3. Bracteoles 5–9 mm long, more than 1.5 times longer than calyx 3. ***A. schindleri***
 Bracteoles to 5 mm long, only slightly longer than calyx 4
4. Distal (or single) article of pod 7–9 mm long 4. ***A. glossocarpum***
 Articles of pod less than 5.5 mm long 5
5. Leaflets ± acute; stipules 10–20 mm long; petioles 10–16 mm long . 5. ***A. stylosanthoides***
 Leaflets obtuse; stipules 6–15 mm long; petioles 3–11 mm long 6. ***A. biarticulatum***

1. *Aphyllodium latifolium* Pedley, sp. nov.

habitu simile *A. schindleri* Pedley sp. nov. autem foliolis latioribus minus elongatis, stipulis brevioribus, inflorescentiis brevioribus bracteis brevioribus praeditis, ramulorum pilis patentibus differt. **Typus:** Queensland. COOK DISTRICT: Dead Horse Creek, 8 km S of Morehead River, 15°04'S 143°43'E, May 1987, *J.R. Clarkson* 7193 & *B.K. Simon* (holo: BRI; iso: BRI, K, L, MBA, NSW, PERTH, QRS).

Aphyllodium sp. (Edward River J.R. Clarkson 3544) Pedley in Henderson (ed.): Queensland plants: names and distribution: 76 (1997).

Erect shrub to 1.5 m tall, branching from the base; branchlets with indumentum of dense spreading fulvous hairs to 1 mm long; stipules glabrous, 6–10 mm long. Leaflets oblong, elliptic or obovate, rounded at the base, obtuse, minutely apiculate at the apex, margins slightly recurved, appressed pubescent on upper surface, prominently reticulate and appressed pubescent on lower surface; terminal ones 30–50 mm long, 12–16 mm wide, 2–3 times as long as wide, the laterals somewhat smaller; stipels, often hidden in indumentum, c. 0.6 mm long; petioles 10–20 mm long. Inflorescences to 18 cm long; primary and secondary bracts c. 5 mm long; pedicels 1.4–2.4 mm long. Flowers: calyx with indumentum of uncinata hairs c. 0.5 mm long, 3–4 mm long, the tube cylindrical 1.8–2.2 mm long, lobes 1.2–1.8 mm long; bracteoles as long as tube; corolla mauve or purple; standard obovate or orbicular with short claw, 6–7.3 mm long, 3.4–5 mm wide; wings rectangular, auriculate, 4.2–5 mm long, 1–1.7 mm wide on claw 1.2–2 mm long; keel about as long as wings; ovary densely pubescent, style slender, stigma minute, surrounded by hairs. Pods of two articles, densely appressed hairy, each 4–5 mm long, 3.3–4 mm wide; seeds c. 2 mm long, 1.5 mm wide.

Selected specimens: Queensland. COOK DISTRICT: Edward River Aboriginal Reserve, 15°10'S 141°40'E, Oct 1980, *Clarkson* 3544 (BRI, MBA); Edward River, Apr 1980, *Garnett* 10 (BRI); c. 80 km NW of Laura, 15°12'S 143°53'E, Jul 1990, *Pedley* 5520 (BRI); east bank of Little Laura River, S of Laura, [15°32'S 144°20'E], May 1975, *Byrnes* 3419 (BRI); 33 miles [53

km] NE of 'Dunbar' H.S., 87 miles [139 km] ESE of Mitchell River mouth [15°45'S 142°46'E], Aug 1966, *Story* 8029 (CANB).

Distribution and habitat: *Aphyllodium latifolium* occurs on sandy soils on roadsides and in eucalypt woodland in the southern part of Cape York Peninsula. Map 1.

Affinities: The species resembles *A. schindleri*, with which it is sympatric, in habit and general appearance but differs in its wider, less elongate leaflets, shorter stipules, shorter inflorescences with shorter bracts, and the spreading hairs of the branchlets.

Etymology: The specific epithet is a compound of Latin, *latus*, wide, and *folium*, leaf: a reference to the wide leaflets of the species.

2. *Aphyllodium parvifolium* Pedley, sp. nov.

ab omnibus aliis speciebus *Aphyllodii* foliis parvioribus usque 4 mm longis, 1–1.2 plo longioribus quam latis et floribus magnis vexillo 7.5–8.5 mm longo ornatis distinguenda. **Typus:** Western Australia. Near Barred Creek, 33 km N of Broome, 17°40'S 122°12'E, 3 April 1988, *K.F. Kenneally* 10612 (holo: PERTH; iso: CANB, DNA).

Prostrate subshrub; branchlets with indumentum of dense, spreading to ascending hairs c. 1 mm long; stipules 4–5.5 mm long with long marginal hairs. Leaflets oblong or orbicular, obtuse at base and apex, moderately dense, long, ascending hairs on both surfaces, terminal and lateral leaflets about equal in size, 3.2–7.5 mm long, 3.2–4 mm wide, c. 1–2 times longer than wide; stipels minute; petioles 2.5–4.5 mm long. Inflorescences to c. 6 cm long; primary and secondary bracts 2–3 mm long; pedicels 1.5–2 mm long. Flower: calyx with sparse indumentum of short uncinata hairs and longer straight marginal ones, 4–4.5 mm long, the tube c. 2.6 mm long, the lobes 1.3–1.9 mm long; corolla pink; standard obovate with short claw, 7.5–8.5 mm long, c. 4 mm wide; wings rectangular, auriculate, c. 5–5.5 mm long, c. 1.2 mm wide on claw 2–2.5 mm long; keel slightly longer than wings; ovary densely pubescent; style flattened towards the tip, stigma minute, fringed with hairs. Pods of 2 articles, appressed hairy on veins, each c. 6 mm long and 4 mm wide; seeds not seen.

Other Specimen: Western Australia. McLarty Hills Oil Camp [c. 19°30'S 123°30'E] J.S. Beard (PERTH).

Distribution and habitat: The species is known only from the collections cited. Map 2.

Affinities: *Aphyllodium parvifolium* is probably most closely related to *A. biarticulatum* but is easily distinguished by its small leaflets less than 1.5 times longer than wide and its large flowers.

Etymology: The epithet is from Latin *parvus*, small and *folium*, leaf, a reference to the small leaves of the species.

3. ***Aphyllodium schindleri* Pedley, sp. nov.** ab aliis speciebus *Aphyllodii* bracteolis calyce 1.5–3 plo longioribus, 5–9 mm longis, ab *A. latifolio* Pedley foliolis angustioribus, ab *A. glossocarpo* Pedley lomentis brevioribus, speciebus Australiensibus ceteris inflorescentis densioribus longioribusque distinguenda. **Typus:** Queensland. COOK DISTRICT: 8 km SW of Beagle North Camp, 13°04'S 141°45'E, June 1982, J.R. Clarkson 4479 (holo: BRI; iso: BRI, DNA, K, NSW, PERTH, QRS).

Dicerma biarticulatum f. *longibracteatum* Schindl., Rep. sp. nov. reg. veg. 20:268 (1924). **Type:** Carpentaria. Mainland opposite Groote Eylandt, Brown '4183' (isosyn: BM, BRI, K).

Aphyllodium novoguineense auct. non (Schindl.) Ohashi; Ohashi, Taiwania 42: 146(1997) p. p.

Aphyllodium sp. (Lockerbie L. J. Brass 18464) Pedley in Henderson (ed.): Queensland plants: names and distribution: 76 (1997).

Shrub to 1.5 m tall; branchlets glabrous or with sparse indumentum of appressed hairs to 2 mm long, often ascending hairs at nodes, or (in Western Australia and Papua New Guinea) of sparse to moderately dense ascending hairs; stipules (10–)13–25 mm long, glabrous, often with a few marginal hairs towards the tips. Leaflets lanceolate, narrowly elliptic, narrowly oblong or oblanceolate, attenuate at the base,

acute or occasionally obtuse, mucronulate at the apex, upper surface glabrous or (especially in northern Cape York Peninsula and Papua New Guinea) with sparse appressed hairs, lower surface with sparse appressed hairs to 1 mm long, densest on margins and midrib, often with sparse erect minute (0.05 mm long) glandular hairs as well; terminal leaflets (15–)25–60(–70) mm long, 4.5–11(–22) mm wide, (3–)4–7(–9) times longer than wide, the laterals slightly smaller; stipels glabrous to 2.4 mm long, often less and sometimes hidden in indumentum; petioles 6–18(–24 in New Guinea) mm long; pulvinuses 1–2(–2.7) mm long, laterals slightly smaller than terminal. Inflorescences dense, 6–16 mm long; striate primary bracts (6–)8–12(–16) mm long, secondary bracts 6–14(–16) mm long (specimens from New Guinea at upper ends of ranges), both with hyaline marginal hairs; pedicels 0.7–2.6 mm long. Flower: calyx with sparse indumentum of hooked hairs c. 0.05 mm long, 2.6–3.7 mm long, tube 1.5–2.3 mm, lobes 1.1–1.5 mm long; bracteoles similar in shape and texture to bracts, shorter or longer than the flower, 5–9.3 mm long; corolla white to mauve; standard obovate, 5.6–9.3 mm long, (2.5–)3–6 mm wide; wings narrowly rectangular, sometimes auriculate, 3.5–5.7 mm long, 0.8–1.4 mm wide, on claw 1.4–1.7 mm long; keel about as long as wings; ovary densely appressed pubescent; style flattened in upper half; stigma minute, surrounded by hairs. Pods of 2 (rarely 1) articles, each 3.5–5 mm long, 2.8–4.2 mm wide, appressed hairy; seeds 2.2–2.8 mm long, 1.6–2 mm wide.

Selected specimens: Western Australia. Carson River, in 1891, Bradshaw & Allen (MEL, NSW 213630); Gorge of Glenelg River, Jul 1950, Gardner 9663 (PERTH). Northern Territory. Arnhem Land, in 1928, Basedow 157 (AD, K); Katherine Gorge National Park, 14°19'S 132°28'E, Jun 1983, King 252 (DNA); Groote Eylandt, May 1972, Levitt (DNA); South Bay, Bickerton Is., 13°45'S 136°06'E, Jun 1948, *Specht 508 (AD, BRI, CANB, K, MEL, PERTH); Gove, Jun 1972, Macdonochie 1532 (DNA, K, MEL, PERTH); c. 39 miles [62 km] NE of Maranboy Police Station, Mar 1965, Lazarides & Adams 113 (BRI, CANB); near Knuckey Lagoon, Nicholson's Place, NE of Katherine, Apr 1956, Burbridge 5107 (BRI, CANB); 7 km from 'Mudginberri' along road to Oenpelli, 12°33'S 132°54'E, Apr 1980, Telford 7752 & Wrigley (CANB, CBG); East Alligator River, 11°59'S 133°41'E, Feb 1973, Dunlop 326 (DNA); Angurli Creek, Murganella-Oenpelli Road, 11°46'S 133°10'E,

Feb 1984, *Whiteman* 1093 (DNA). **Queensland.** Cook DISTRICT: Cape York, 10°42'S 142°32'E, Jul 1985, *Thiele* 919 (BRI, CANB); Lockerbie, 10 miles [16 km] WSW of Somerset, Apr 1948, **Brass* 18464 (BRI, CANB, K); Captain Billy Landing, 11°35'S 142°43'E, May 1971, *Norris* [AQ 230277] (BRI); Mapoon, 11°58'S 141°52'E, Jun 1985, *Gunness* AG 2024 (BRI); 17 km from Merapah homestead, 13°49'S 142°22'E, May 1987, *Clarkson* 7143 & *Simon* (BRI, K, MBA, QRS). **Papua New Guinea.** Between Laloki & Hiwick R., 9°25'S 147°17'E, Feb 1964, **Womersley* 19094 (BRI, K, L, NSW); Port Moresby, Feb 1937, **Brass* 8781 (BRI, BM).

*These and other specimens seen, determined by Ohashi (1973) as *Dicerma biarticulatum* subsp. *australiense*.

Distribution and habitat: The species occurs in sandy soils, sometimes on sandstone, usually in open eucalypt communities, though also reported from the edges of *Melaleuca* swamps and on coastal dunes. It occurs in the Kimberley region of Western Australia, the Northern Territory (north of about 15°S latitude), eastern Queensland from Cape York south to about 19°S latitude, and near Port Moresby in Papua New Guinea. There are notable disjunctions between the Kimberley and Northern Territory occurrences and across the southern shore of the Gulf of Carpentaria. Map 3.

Affinities: *Aphyllodium schindleri* is distinguished from other species by its dense inflorescences and remarkably long bracts and bracteoles; its closest relative among Australian species is probably *A. latifolium*. From specimens determined by Ohashi at BRI and other herbaria, his key to subspecies and the distribution map published by him (Ohashi 1973), it appears that he considered this to be *Dicerma biarticulatum* subsp. *australiense* Schindl. Schindler (1924) recognised three formae of *D. biarticulatum* var. *australiense*, each of which is treated as a distinct species here. 'Typical' subsp. *australiense* (that is, f. *australiense*, f. 'genuinum' of Schindler) is included in *Aphyllodium biarticulatum*. The identity of *Dicerma biarticulatum* var. *australiense*, its typification, and the misapplication of the name *Aphyllodium novoguineense* are discussed under *A. biarticulatum*.

Etymology: The specific epithet commemorates Anton Karl Schindler (1879–1964) who, in a remarkably brief but fruitful botanical career in the first quarter of this century, laid solid foundations for later critical work on the Desmodiineae. Regrettably a quantity of his work remained unpublished on his retirement from plant taxonomy (see Schubert 1964).

4. *Aphyllodium glossocarpum* Pedley, sp.

nov. ab aliis speciebus *Aphyllodii* fructibus in lomenta distincta aegre separatis, lomento solitario vel distali 7–9 mm longo purpurascenti distinguenda.

Typus: Western Australia. 19.5 km from Beagle Bay Mission turn-off on the road to Cape Leveque, June 1981, *B.R. Maslin* 4928 (holo: PERTH; iso: BRI, K).

Dicerma biarticulatum f. *plumosum* Schindl., Rep. sp. nov. reg. veg. 20:268 (1924). **Type:** Western Australia. Brunswick Bay, Oct 1820, *A. Cunningham* 267 (holo: K; iso: BM).

Desmodium novae-hollandiae var. *caudatum* Domin, Biblioth. Bot. 89:212 (1926). **Type:** Western Australia. Brunswick Bay, Oct 1820, *A. Cunningham* 267 (holo: K; iso: BM).

Shrub to 2 m tall; branches with sparse indumentum of appressed hairs c. 1 mm long; stipules ± glabrous, 5–12 mm long. Leaflets linear, narrowly oblong or narrowly obovate, obtuse at the base, obtuse or acutish at the tip, glabrous on the upper surface, sparsely appressed pubescent on the lower; terminal leaflets 15–40 mm long, 3.5–5.5 mm wide, 3.5–8 times longer than wide, the laterals slightly smaller; stipels c. 0.5 mm long; petioles 5–10 mm long. Inflorescences to c. 25 cm long; primary bracts 3.5–5.5 mm long, secondary bracts slightly smaller, both with a few marginal hairs; pedicels 1.4–2.5 mm long. Flower: calyx with sparse indumentum of short (c. 0.05 mm long) uncinat hairs, 3.5–4.5 mm long, the tube c. 2 mm long, the lobes 1.5–2.5 mm long; bracteoles about as long as the tube; corolla mauve to pale purple; standard obovate 6.5–7.5 mm long, 3.5–4.5 mm wide; wings narrowly

rectangular, not auriculate, 4–5 mm long, 1.2–1.4 mm wide, on claw 2–2.4 mm long; keel about as long as wings; ovary densely pubescent; stigma surrounded by hairs. Pods 1 or 2 seeded, scarcely divided into distinct articles, the proximal one 5.5–7.5 mm long, the distal or single one longer, 7–9 mm long, all 3.2–4.5 mm wide, appressed pubescent; seeds c. 3 mm long and 2 mm wide.

Specimens: Western Australia. 1 km NW of Beagle Bay Mission, 16°59'S 122°40'E, Apr 1985, *Martin* 31 (CANB, PERTH); Wonganut Spring, 19 km ESE of Coulomb Point, Dampier Penin., 17°15'S 122°19'E, Jun 1984, *Kenneally* 9039 (PERTH).

Distribution and habitat: The species is known only from the four collections cited, all from coastal areas of the Kimberley region, Western Australia. Cunningham's specimen probably came from Marigui Promontory (c. 15°15'S 125°00'E) where he 'obtained a large addition to his collection' (King, 1827:439) on this, the last anchorage of the 'Mermaid' on the north-west coast. It is reported to occur on sand (Kenneally, in sched.) Map 4.

Affinities: *Aphyllodium glossocarpum* bears a general resemblance to *A. biarticulatum* but differs from it and other species in having purplish fruits which are scarcely divided into distinct articles. The single or distal loment (when two are found) is 7–9 mm long.

Etymology: The epithet is from Greek *glossa*, tongue and *karpos*, fruit, an allusion to the long purplish tongue-like articles of the fruit.

5. *Aphyllodium stylosanthoides* Pedley, sp. nov. aspectu distinctivo sed simul *A. biarticulato* (L.) Gagnep. arcte affinis a quo differt stipulis plerumque longioribus, 10–20 mm longis, petiolis longioribus, 10–16 mm longis, foliolis plus minusve acutis longioribus, (15–)20–35(–55) mm longis, elongatioribus, 4–7(–12)-plo longioribus quam latis; ab *A. schindleri* Pedley foliolis plerumque angustioribus, 3–6 (raro 12) mm latis, bracteis plerumque brevioribus, 4.5–10.5 mm longis, bracteolis brevioribus, 3.5–4.2 mm longis; ab *A. latifolio* Pedley stipulis longioribus, foliolis angustioribus elongatioribus. **Typus:** Western

Australia. Near Wonjarring Gorge in Carson Escarpment, 10 km E of 'Theda' H.S., 25 March 1978, *M. Lazarides* 8712 (holo: CANB; iso: BRI, K, NSW, PERTH).

Erect or ascending annual stems to c. 1 m from perennial woody rootstock; branchlets with indumentum of sparse to moderately dense appressed hairs up to 2 mm long; stipules 10–20 mm long, glabrous or with a fringe of hairs. Leaflets linear, narrowly oblong, narrowly elliptic or occasionally oblanceolate or narrowly obovate, ± acute, glabrous on upper surface, with sparse appressed hairs on lower surface, dense on margins and midrib, as well as minute (× 20 needed) hairs on lower surface, rarely also on upper; terminal leaflets 15–35(–55) mm long, 3–6(–12) mm wide, 4–7 times longer than wide, laterals a little smaller; stipels glabrous, c. 1–1.5 mm long; pulvini densely pubescent, 1–2 mm long; petioles 10–16 mm long. Inflorescences to 12.5 cm long, but often shorter; primary bracts 4.5–10.5 mm long, secondary bracts slightly shorter; pedicels 1.5–2 mm long. Flower: calyx with sparse short hooked hairs, 3.3–4 mm long; corolla pink; standard narrowly ovate c. 6.5 mm long, 3.3–4 mm wide; wings narrowly rectangular, not auriculate, 4–5.2 mm long, 0.5–1.2 mm wide on claw 1.5–2 mm long; keel about as long as the wings; ovary densely pubescent, style flattened towards the tip. Pods of 1 or usually 2 articles, each 3.8–5.3 mm long, 2.8–4 mm wide, rather sparsely pubescent at maturity with short appressed hairs; seeds c. 3 mm long, 1.5–2 mm wide.

Selected specimens: Western Australia. Carson Escarpment, S of Coucal Gorge, Drysdale River National Park, ± 150°2'S 126°49'E, Aug 1975, *George* 13883 (PERTH); Bioga Falls, Drysdale River National Park, 15°08'S 127°06'E, Aug 1975, *Kenneally* 3061 (PERTH). Northern Territory. 10 km SE of Nourlangie Ranger Station, 12°50'S 132°42'E, May 1980, *Lazarides* 8890 (CANB); 5 km NNW of Koongarra, 12°50'S 132°50'E, May 1980, *Craven* 5580 (CANB, MEL); 21.5 miles [34.5 km] from Adelaide River camp, 13°02'S 131°03'E, Aug 1946, *Blake* 16715 (BRI, DNA); 6 miles [10 km] from Litchfield, 13°27'S 130°30'E, Jul 1946, *Blake* 16644 (BRI, DNA, K, MEXU, MO); Noonamah [12°38'S 131°04'E], Apr 1968, *Byrnes* NB602 (DNA, NSW).

Distribution and habitat: The species has been recorded from habitats similar to those of *A.*

schindleri: sandy soil, sometimes shallow or rocky, in eucalypt communities (*Eucalyptus tetradonta* F. Muell and *E. miniata* A. Cunn. ex Schauer particularly), but also in damp situations where it is associated with *Melaleuca* spp. It occurs in the eastern part of the Kimberley region of Western Australia and the north-western part of the Northern Territory. Map 5.

Affinities: *Aphyllodium stylosanthoides* has a distinctive facies but appears to be close to *A. biarticulatum*. It has generally longer stipules, petioles and leaflets; the leaflets are more or less acute and have a greater length/width ratio. It is less closely related to *A. schindleri* and *A. latifolium*; the former has longer bracteoles and usually longer bracts and wider leaflets; and the latter shorter stipules and wider leaflets.

Etymology: The specific epithet is derived from the generic name *Stylosanthes*. In habit and in its rather slender reddish stems, *A. stylosanthoides* resembles some species of *Stylosanthes* introduced into tropical Australia as fodder plants.

6. *Aphyllodium biarticulatum* (L.) Gagnep., Not. Syst. 3(8):254 (1916); Pedley, Rev. Hand. Fl. Ceylon 10:167 (1996); *Dicerma biarticulatum* (L.) DC., Prodr. 2:339 (1825), nom. illeg.; *Echinolobium biarticulatum* (L.) Desv., Mem. Soc. Linn. Paris 4:310 (1825); *Desmodium biarticulatum* (L.) F. Muell., Fragm. Phyt. Austr. 2:121 (1861); *Hedysarum biarticulatum* L., Sp. Pl. 747 (1753). **Type:** Herb. Hermann vol. 3 fol. 15, No. 296 (lecto: BM, *vide* Pedley in Turland & Jarvis (1997)).

Dicerma biarticulatum var. *australiense* Schindl., Rep. sp. nov. reg. veg. 20:268 (1924) (excl. f. *longibracteatum* Schindl. & f. *plumosum* Schindl.); *Desmodium biarticulatum* var. *australiense* (Schindl.) Meeuwen, Reinwardtia 6:247 (1962); *Dicerma biarticulatum* subsp. *australiense* (Schindl.) Ohashi, Ginkgoana 1:255 (1973); *Aphyllodium australiense* (Schindl.) Ohashi, Taiwaniana 42: 143 (1997). **Type:** Bowen River,

Bowman 269 (lecto: MEL, chosen here).

Desmodium novae-hollandiae Domin, Biblioth. Bot. 89:212 (1926) var. *novae-hollandiae* ('typicum' Domin). **Type:** Sandige Mischwalder in der Nahe der Russell-Mundung, Feb 1910, Domin '4758' (lecto: PR 527353, chosen here).

Desmodium novae-hollandiae f. *latifolium* Domin, loc. cit. **Type:** Savannenwalder zwischen Chillagoe und Walsh River, Feb 1910, Domin '4755' (holo: PR 527350).

Prostrate, ascending or erect subshrub to c. 0.5 m high usually with dense indumentum of appressed or somewhat spreading white hairs to c. 1 mm long; stipules 4–13(–15) mm long with a few hairs on margin or tip. Leaflets linear, narrowly elliptic, narrowly obovate, elliptic or obovate, attenuate at the base, obtuse, mucronulate at the apex, glabrous or with sparse appressed or weak ascending hairs on upper surface, sparsely appressed pubescent or with rather dense ascending hairs on lower surface; terminal ones 7–25(–38) mm long, 2–6.5(–10) mm wide, (1.5–)2.5–6.5(–9) times longer than wide, the laterals usually a little smaller, (6–)7.5–22 mm long, 2–6(–8) mm wide, 1.5–5.5(–9) times longer than wide; stipels 0.3–0.7(–1) mm long often hidden in the hairs of the pulvinuses which are 0.6–1(–1.5) mm long; petioles 3–9(–12) mm long. Inflorescences terminal and axillary, rather dense, up to 20 cm long, the rachis with indumentum of moderately dense short uncinata hairs, often with some straight appressed hairs towards the base; primary bracts 3.5–10 mm long, secondary bracts 2.5–7 mm long, pedicels with indumentum of short uncinata hairs, 0.9–1.8(–2.7) mm long at anthesis. Flower: calyx with sparse indumentum of short uncinata and a few long straight white hairs, 2.5–3.5(–4) mm long, the tube 1.2–1.8(–2.2) mm long, the lobes about equal in length, 1.2–2.2 mm long; bracteoles (1.7–)2–3.6(–4.8) mm long; corolla described by most collectors as mauve or pink, but also bluish, purple or red, standard obovate, (5–)5.5–7.5 mm long, (2.5–)3–4.4 mm wide; wings narrowly oblong, ± auriculate, obtuse (2.8–)3–4.7 mm long on

claw (0.6–)0.8–1.3 mm long; keel petals about as long as the wings; ovary with dense appressed or rarely ascending hairs. Pods with 1 or 2 articles, each 3–5 mm long, 2.5–4 mm wide with indumentum of appressed hairs, glabrescent, or dense \pm spreading and often persistent hairs; seeds 2–3.8 mm long, 1.2–2.2 mm wide.

Selected specimens: **Western Australia.** Near junction of Drysdale River & Mogurnda Creek, 15°02'S 126°55'E, Aug 1975, *George* 1353 (PERTH); 60 km from Kununurra, 16°01'S 128°46'E, Apr 1977, *Pullen* 10686 (CANB, NSW). **Northern Territory.** 30 miles [48 km] E of 'O.T.' Station, Aug 1948, *Perry* 1487 (BRI, CANB, NSW); 11 miles [18 km] NE of 'Alexandria' Station, Jun 1948, *Perry* 1472 (AD, BRI, CANB, K, MEL, NSW, PERTH). **Queensland.** BURKE DISTRICT: Woolgar, c. 19°40'S 143°10'E, Aug 1915, *Bick* (BRI, NSW); Between 'Corinda' & 'Westmoreland, 17°40'S 138°28'E, *Pullen* 10686 (CANB, NSW); Albert River, *Mueller* (K, MEL); Sweers Is., Nov 1802, *Brown* (BRI, BM); same place, *Henne* (MEL) & same place, Jun 1901, *J.F. Bailey* [AQ 97444] (BRI); 'Chudleigh Park' Station, 110 miles [176 km] N of Hughenden, Feb 1931, *Hubbard & Winders* 7606 (BRI, K); COOK DISTRICT: Yorkey's Knob beach, Apr 1962, *McKee* 9034 (BRI, CANB, K, NSW); 3 miles [5 km] E of Mareeba, May 1953, *Thorne* 21116 & *Jones* (BRI, RSA); NORTH KENNEDY DISTRICT: Magnetic Is., Jan 1931, *Hubbard & Winders* 6665 (BRI, K); 6 km N of Elliot River, c. 19°50'S 147°50'E, Apr 1975, *McDonald & Batianoff* 1386 (BRI, K); MITCHELL DISTRICT: c. 12 km SW of Barcaldine 23°29'S 145°12'E, Jun 1977, *McDonald* 2692 (BRI); ad opp. Jericho, *Domin* '4760' (PR).

Distribution and habitat: *Aphyllodium biarticulatum* is restricted to sandy soils in open situations in eucalypt communities, on coastal dunes, on roadsides and occasionally in cultivation. In Australia it extends from the northern part of the Kimberley region of Western Australia, across the north of the Northern Territory to Queensland south to the Tropic of Capricorn. It appears to be more common in the east of its range than it is in the west. Its extreme variability within Australia is discussed below. Outside Australia it extends through Malesia to southern China, Indo-China, India and Sri Lanka. Map 6.

Affinities: The species is closely related to *A. parvifolium*, *A. stylosanthoides* and *A. hispidum* (Schindl.) Ohashi which have rather restricted ranges, the first two in north-western Australia, the last in south-eastern Asia. *A. latifolium*, *A. schindleri*, *A. glossocarpum* and

probably *A. novoguineense* are less closely related to it and may represent a more remote evolutionary line.

Variation and typification: Beside nomenclatural problems discussed (p. 211) the treatment of *Hedysarum biarticulatum* L. has been confused by different classifications resulting from differing concepts of genera and infra-generic taxa.

Mueller (1861), in transferring *H. biarticulatum* to *Desmodium* noted that Wight's figure (Icon. Plant. Ind. Or. 2 (1841) t. 419) did not at all clearly represent ('haud clare exprimit') the Australian species, but invoked the authority of J.D. Hooker in treating Indian and Australian species as the same. Bentham (1864) noted that some Australian specimens differed from the Indian ones but considered all belonged to one species; despite Bentham's remark to the contrary, Wight's figure is not a good representation of the species, either in India or Australia.

Schindler (1924) and Domin (1926) used much the same set of specimens, but independently produced significantly different infra-specific classifications of *A. biarticulatum*. Schindler considered the whole genus *Dicerma* (sensu Bentham) while Domin only the Australian occurrences of *Desmodium biarticulatum* sensu Mueller (and Bentham). Schindler described *Dicerma hispidum* and *D. novoguineense* from single specimens from Burma and New Guinea respectively and divided *Dicerma biarticulatum* into six taxa: three varieties, one consisting of three formae. They are:

Dicerma biarticulatum (L.) DC.

var. *biarticulatum*

var. *collettii* Schindl.

var. *australiense* Schindl.

f. *australiense* (f. *genuinum* Schindl., nom. inval.)

f. *longibracteatum* Schindl..

f. *plumosum* Schindl.

He considered *D. biarticulatum* var. *biarticulatum* to be widely spread on all coasts of the Indian Ocean and to be very uniform everywhere. Evidently, however, he did not believe it to occur in Australia as he cited no Australian specimens and considered *Desmodium biarticulatum* sensu Mueller and Benth. to be *Dicerma biarticulatum* var. *australiense* which he described as ‘varietas valde variabilis’. I have seen no material of *Dicerma biarticulatum* var. *collettii* which was described from a single collection from “Upper Burma”. *Dicerma biarticulatum* f. *longibracteatum* and f. *plumosum* are treated here as distinct species *Aphyllodium schindleri* and *A. glossocarpum* respectively. With the removal of these, var. *australiense* still exhibits a wide range of variation..

Domin placed *Hedysarum biarticulatum* in *Desmodium* and described *D. novae-hollandiae* as new, referring to it most, though not all, Australian specimens previously considered *D. biarticulatum*. He subdivided *D. novae-hollandiae* into four taxa: two varieties, one made up of two formae:

Desmodium novae-hollandiae Domin

var. *novae-hollandiae* (var. *typicum* Domin, nom. inval.)

f. *novae-hollandiae* - automatically

f. *latifolium* Domin

var. *caudatum* Domin

Desmodium biarticulatum var. *caudatum* is based on Cunningham 267 which is also the type of *Dicerma biarticulatum* f. *plumosum* Schindl. and consequently is treated here as *Aphyllodium glossocarpum*. Here the correspondence between Domin’s and Schindler’s classifications ends. Domin was aware of the diffuseness of his classification and remarked that in f. *latifolium* one could see a weak approach to var. *caudatum* and that Brown ‘4183’ was almost intermediate between the type (that is, f. *novae-hollandiae*) and var. *caudatum*. Brown 4183 is, in fact, one of the two syntypes of *Dicerma biarticulatum* f. *longibracteatum* Schindl. Furthermore,

Domin cited one specimen as *Desmodium biarticulatum* sensu stricto, Schultz 534, which is a syntype of *Dicerma biarticulatum* f. *australiense* Schindl.

Later workers have modified Schindler’s scheme of classification but have paid scant attention to Domin’s. Regrettably these later workers have either not consulted Schindler’s and Domin’s type specimens or, if they have, they have not cited them. Knaap-van Meeuwen (1962) included *Dicerma* in *Desmodium*. She suggested that *Desmodium novae-hollandiae* to be not specifically distinct from *D. biarticulatum* (to which she also referred *Dicerma biarticulatum* var. *collettii*, *Dicerma hispidum* and *Dicerma novoguineense*) and transferred *Dicerma biarticulatum* var. *australiense* to *Desmodium biarticulatum*. Study of her key shows that her concept of var. *australiense* was based entirely on f. *longibracteatum* and not at all on either f. *australiense* or f. *plumosum*. Verdcourt (1979), whose work was not intended to be a critical treatment, followed Knaap-van Meeuwen exactly.

To a large extent Ohashi (1973) adopted Schindler’s generic concepts but, with a change of rank, Knaap-van Meeuwen’s treatment of infrageneric taxa. He accepted *Dicerma biarticulatum* subsp. *biarticulatum*, subsp. *australiense* (Schindl.) Ohashi and subsp. *hispidum* (Schindl.) Ohashi. From the key to subspecies, the distribution map of *Dicerma biarticulatum* and the photograph of Brass 18464, it is evident that Ohashi also based his subsp. *australiense* solely on *Dicerma biarticulatum* f. *longibracteatum*. Ohashi cast doubt on Knaap-van Meeuwen’s treatment of *Dicerma novoguineense* but took no action, probably because he had seen no specimen. Ohashi (1997b) accepted *Aphyllodium* as the correct name for the genus previously treated by Benth. as *Dicerma* (see p. 211). He effected the transfer of some names from *Dicerma* to *Aphyllodium* and modified his previous treatment. In doing so he further complicated an already tangled situation. He cited no specimens, type or otherwise, and seems not to have appreciated the desirability of lectotypifying names to establish their

application. He changed the status of *Dicerna biarticulatum* f. *australiense* which he raised to specific rank as *Aphyllodium australiense*. He transferred *D. novoguineense* to *Aphyllodium*, placing *D. biarticulatum* f. *longibracteatum*, f. *plumosum* and f. *australiense* (p. p.) in its synonymy. He gave its distribution as Australia and New Guinea. Perhaps, appreciating that *D. novoguineense*, *D. biarticulatum* f. *longibracteatum* and *D. biarticulatum* f. *plumosum* differ from *D. biarticulatum* f. *australiense* most conspicuously in having larger leaflets, stipules and bracts, he referred them to *A. novoguineense*, since the epithet *novoguineense* must be used at specific rank.

Application of the name *A. novoguineense* presents a major difficulty. I have not seen the type but have seen one poor specimen of the species (J.H. Barrett 4270, BRI ex LAE) collected from near the type locality, Astrolabe Range, Papua New Guinea. Examination of it and a reading of the protologue have persuaded me that it represents a species distinct from *A. schindleri* (*D. biarticulatum* f. *longibracteatum*), *A. glossocarpum* (*D. biarticulatum* f. *plumosum*) and *A. australiense*, the last of which as lectotypified (p. 216), is the same as *A. biarticulatum* sensu stricto. *A. novoguineense* has stems with long ascending fulvous hairs and usually longer stipules and bracts than have other taxa. It appears to be rare and restricted to Papua New Guinea.

In habit, size and shape of vegetative parts and in the indumentum of stems, leaves and pod-articles *A. biarticulatum* is extremely variable, with the degree of variability within Australia probably greater than it is outside the continent. This variability is reflected in the different treatment of species discussed above. Study of specimens from Sri Lanka (Pedley 1996), the type locality of *Hedysarum biarticulatum*, indicated that though the plants there tend to have somewhat smaller stipules and primary and secondary bracts, they fall within the range of variability of Australian plants and recognition of a subspecies or variety for Australian plants is not warranted.

After specifically distinct entities have been removed *A. biarticulatum* remains a disconcertingly variable species. Preliminary studies suggested that two variants could be recognised: (a) a prostrate plant with narrow (2–3 mm wide) leaflets found usually on coastal sands on the east coast, and (b) subshrub with short obovate leaflets 1.5–3 times longer than wide with large pod articles with dense somewhat spreading hairs which occurs in semi-arid areas inland around the south-western part of the Gulf of Carpentaria. Though extremes of these variants are distinctive the variants merge into the more 'typical' populations of the species and formal recognition is not warranted.

Dendrolobium (Wight & Arn.) Benth. in Miquel, Pl. Junghuniana: 215, 216 (1852); Schindl., Rep. sp. nov. reg. veg. 20:278 (1924); Hutchinson, Gen. Pl. 1:483 (1964); Ohashi, Ginkgoana 1:50 (1973), Taiwanica 42: 135 (1997); *Desmodium* subg. *Dendrolobium* Wight & Arn., Prodr. 1:223 (1834); Baker in J.D. Hooker, Fl. Brit. India 2: 161 (1876); *Desmodium* sect. *Dendrolobium* (Wright & Arn.) Benth. in Benth. & J.D. Hooker, Gen. Pl. 1:519 (1868). Type: *Dendrolobium umbellatum* (L.) Benth.

Holtzia Schindl., Rep. sp. nov. reg. veg. 22:285 (1926). **Type:** *H. umbellata* Schindl. (= *Dendrolobium stipatum* S.T. Blake).

Ohashi (1973) characterised *Dendrolobium* by its axillary subumbellate inflorescences, uniparous flowers, monadelphous stamens, conspicuously long styles, thick corky or coriaceous pericarps and conspicuously rim-arillate seeds. The inflorescences of *D. polyneurum* are elongate racemes, but the combination of the other characters listed distinguished *Dendrolobium* sharply from all other genera except *Phyllodium*. The emphasis placed on the foliaceous bracts of *Phyllodium* obscures the relationship of it with *Dendrolobium*. This relationship is discussed under *Phyllodium*.

Ohashi (1973) recognised 11 species in the genus with the Indo-Chinese region the

centre of diversity with eight species occurring there. The recognition of five species confined to the Australian region in the present study places northern Australia as another area of

speciation. Some of the Australian species are adapted to a strongly seasonal climate with wildfires in the dry season.

Key to species

1. Lower calyx lobe markedly (1 mm or more) longer than other lobes 2
 Lower calyx lobes almost the same length as other lobes 3
2. Plant prostrate; branchlets with spreading or ascending hairs; pedicels
 4–10 mm long; bracteoles c. 1 mm long. **1. *D. multiflorum***
 Plant a shrub or tree to 6.5 m (? 12.5 m); branchlets with dense white
 appressed hairs; pedicels c. 2 mm long; bracteoles 2.5–3.6 mm long ... **6. *D. arbuscula***
3. Flowers in elongate racemes, axis up to 70 mm long; leaflets with dense
 silvery appressed hairs on underside. **2. *D. polyneurum***
 Flowers in umbellate racemes, sessile or axis to 10 mm long; undersides of
 leaflets with appressed hairs, sometimes dense but not silvery. 4
4. Wing petals shorter and much narrower than the keel petals; terminal leaflets
 50–140(–170) mm × (25–)35–70(–85) mm **5. *D. umbellatum***
 Wing petals as long as or longer than keel petals and not markedly narrower
 than them; terminal leaflets to 65 mm × 30 mm 5
5. Veins conspicuously depressed on upper surface of leaflets; terminal leaflets
 8–14(–17) mm wide; pedicels (2–)5–7 mm long; **3. *D. cheelii***
 Veins not conspicuously depressed on upper surface of leaflets; terminal
 leaflets 17–30 mm wide; pedicels 6–16 mm long **4. *D. stipatum***

1. *Dendrolobium multiflorum* Pedley, sp. nov. affinis *D. stipatum* S.T. Blake; habitu prostrato, plerumque petiolis brevioribus, foliolatis latoribus instructis, calycis lobis (praesertim inferioribus) longioribus petalis parvioribus differt.
Typus: Northern Territory: 4 miles [6 km] SE of Katherine [14°29'S 132°19'E], December 1963, *M. Lazarides* 6995 (holo: CANB; iso: BRI, DNA, MEL, PERTH).

Annual stems up to 1.2 m long trailing from perennial rootstock; branchlets angular with indumentum of crisp matted hairs to 0.5 mm long; stipules striate, pubescent on the outside, 4–7 mm long. Leaflets ovate or broadly ovate, obtuse or slightly mucronulate, discolorous, sparse slightly ascending hairs on both surfaces, mainly on veins beneath, sometimes becoming glabrous on upper surface, 8–11 lateral veins on each side of midrib; terminal leaflet 50–90 mm long, 30–55 mm wide, laterals distinctly smaller 30–45 mm long, 17–35 mm wide, both

1.3–2 times longer than wide; rachis 8–17 mm long, petiolules 1.3–2.3 mm long, stipels 1–3 mm long, petioles 8–11 mm long. Flowers in fascicles of 10–20, sessile in the upper axils; bracts 2–2.5 mm long, bracteoles sometimes a little below the base of the calyx, c. 1 mm long; pedicels 4–10 mm long, with spreading white hairs. Flowers: calyx with spreading hairs, 5.3–6 mm long, tube c. 1.7 mm long, upper lobe 2.3–3.5 mm long, laterals the same size or shorter, 2.3–3 mm long, the lower setulose, incurved, distinctly longer, 3.6–4.4 mm long; corolla white or yellowish tinged with pink: keel oblong, rounded at the top, narrowed but not clawed at the base, 6.5–8 mm long, 4.5–6 mm wide; wings 4.5–6 mm long on claw 1–1.5 mm long, slightly shorter (by 0.5 mm) than keel petals; ovary pubescent with 1 ovule. Pod not seen.

Other specimens: Northern Territory. 22.4 miles [35.8 km] E of Adelaide River [c. 13°25'S 131°25'E], Mar 1961, *Chippendale* NT 7716 (BRI, DNA, K MEL, PERTH); Bull Creek, 13°54'S 131°17'E, Jul 1946, *Blake* 16294 (BRI).

Distribution and habitat: The species is restricted to a small area in the extreme north of the Northern Territory where it occurs on sandy soils. Map 7.

Affinities: *Dendrolobium multiflorum* appears to be related to *D. stipatum* but differs in its prostrate habit, wider and usually less elongate leaflets, fascicles with more flowers and the lower lobe of the calyx longer than the others.

Etymology: The specific epithet is derived from Latin, *multus* many, and *flos, floris*, flowers, an allusion to the plant's many flowered fascicles.

2. *Dendrolobium polyneurum* (S.T. Blake) Pedley, comb. nov.

Desmodium polyneurum S.T. Blake, Austr. J. Bot. 2:119 t.3 (1954). **Type:** Northern Territory. Near Station Creek, 13°42½'S 131°04'E, July 1946, S.T. Blake 16474 (holo:BRI; iso:K).

Ascending annual stems to 1 m long arising from perennial rootstock; branches ± terete with indumentum of dense appressed matted hairs c. 1 mm long; stipules deltoid, connate nearly to the middle, pubescent 3–5.5 mm long, early deciduous. Leaves: leaflets obovate or oblong, obtuse or retuse, sometimes mucronulate, lamina with dense short appressed hairs on both surfaces, becoming rather sparse on upper surface, 10–13 lateral veins on each side of midrib; terminal leaflet 40–90 mm long, 23–70 mm wide, 1.6–2 times longer than wide, laterals smaller, usually oblong, 35–70 mm long, 20–40 mm wide; stipels setaceous, 1–2 mm long; petiolules 2–3.5 mm long, rachis 4–20 mm long; petioles 3–20 mm long. Flowers in axillary racemes up to 70 mm long, the young unopened flowers crowded at the apex of the rachis; bracts ovate-acuminate, 2–3 mm long, deciduous; pedicels 2–7 mm long; bracteoles 1.5–2 mm long. Flowers: calyx 5.5–7.5 mm long, tube 3 mm long, obtuse at base, gradually widening upwards; lobes lanceolate, acute, the two upper ones at first connate nearly to the tip, finally separating; corolla white: standard obovate, c. 10 mm long and 7 mm wide, ± clawed; wings 10 mm long, spurred near the base; keel petals as long as the wings,

subobtusate, slightly incurved; ovary hirsute. Pods densely pubescent becoming only moderately so when old, both margins constricted between the seeds; articles (1–)2–4, longitudinally oval, nearly symmetrical, 6–9 mm long, 5–6 mm wide, woody and indehiscent; seeds not seen mature.

Selected specimens: Northern Territory. 2.5 miles [4 km] SW of 'Tipperary' homestead, Jul 1961, *Lazarides* 6677 (CANB, K, MEL PERTH); 39 miles [50 km] SW of 'Dorisvale' Station [14°46'S 131°06'E] May 1952, *Perry* 2796 (CANB, K, MEL); 6 miles [10 km] N of Wilton River Crossing, Jun 1972, *Byrnes* 2617 (DNA, K).

Distribution and habitat: *Dendrolobium polyneurum* occurs only in the northern part of the Northern Territory on sandy soils in eucalypt communities. It has not often been collected and seems to be rare. Like *D. cheelii* and *D. stipatum* the species appears to be a pyrophyte with annual stems arising from a woody perennial rootstock. Map 8.

Affinities: In the protologue of *Desmodium polyneurum*, Blake referred it to *Desmodium* sect. *Dollinera* (Endl.) Schindl. and it does bear a general resemblance to some species of that section, particularly *D. hayatae* Ohashi. Its monadelphous stamens and bracteoles support such a placement, but the structure of its inflorescence is quite different from that of sect. *Dollinera*. Its flowers are arranged in long axillary racemes, each pedicel subtended by a bract, whereas in sect. *Dollinera* flowers are in 6–8 flowered fascicles; that is, each bract subtends 6–8 pedicellate flowers. Though long racemes are unusual in *Dendrolobium*, Ohashi (1973:14) noted some specimens of *D. umbellatum* and *D. triangulare* (Retz.) Schindl. with 'a few axillary racemes mixed with short racemes or subumbels'. The pods of *D. polyneurum* are similar to those of other species of *Dendrolobium* such as *D. arbuscula* and *D. umbellatum*. Though its axillary racemes sets it apart from all other species the affinities of *D. polyneurum* are with *D. stipatum* and *D. cheelii*.

3. *Dendrolobium cheelii* (C.A. Gardner) Pedley, comb. nov.

Alysicarpus cheelii C.A. Gardner, West. Austr. For. Dept. Bull. 32:57 (1923).

Type: Western Australia. Between Vansittart and Napier Broome Bays, August 1921, *C.A. Gardner* 1040 (holo: PERTH).

Erect annual stems to 0.5 m tall from perennial woody rootstock; branches with indumentum of moderate to dense appressed, often matted hairs 0.5–0.7 mm long; stipules 3–6 mm long, striate, sparsely to densely hairy outside, glabrous inside. Leaves (1-) or 3- foliolate; leaflets elliptic or obovate, obtuse or rarely slightly acuminate, mucronulate, sparsely pubescent with appressed or weak, slightly ascending hairs on both surfaces, mainly on veins beneath, 4–10 lateral veins on each side of midrib, deeply impressed on upper surface; terminal leaflet (13–)20–60 mm long, (4–)8–14(–18) mm wide, 2.5–4.5 times longer than wide, laterals somewhat smaller; stipels to 1.8 mm long, slightly longer than the petiolules; petiolules 0.5–1.5 mm long, rachis 1–6 mm long; petioles 4–10 mm long. Flowers in fascicles of 3–8 in upper axils; bracts and bracteoles c. 1 mm long, pedicels (2–)5–7 mm long. Flowers: calyx 3.5–4 mm long with sparse, longish, \pm appressed hairs and short, \pm erect, uncinat hairs, tube 1.7–2 mm long, lobes of \pm equal length, 1.6–2 mm long, or the lower to 2.5 mm long, longer than the others; corolla pink or yellow with a pink keel; standard \pm orbicular 4.8–5.5 mm long, 3.5–4.5 mm wide, on claw c. 1.5 mm long; wings 4.5–5.5 mm long, c. 1.8 mm wide, on claw 1.7 mm long; keel petals slightly shorter than the wings; ovary densely pubescent, ovules up to 3. Pod of 1 or 2 articles, each about 8 mm long and 5 mm wide, reticulately veined, densely pubescent; seeds not seen.

Other specimens: Western Australia. Near Carlia Creek, near Carson River, Drysdale River National Park, 15°02'S 126°49'E, Aug 1975, *George* 13939, sterile (PERTH); Little Falls, 14°49'S 125°42'E, July 1976, *Lewis* 44 (K, PERTH); 4 miles [6 km] N of mining campsite, Mitchell Plateau, 14°47'S 125°48'E, Dec 1982, *Kenneally* 8666 (PERTH); Gibb River, Hann District, Jan 1951, *Gardner* 9893 (PERTH).

Distribution and habitat: *Dendrolobium cheelii* is confined to the Kimberley region of Western Australia where it occurs on sandy or loamy soils in eucalypt woodland. It is a pyrophyte with annual stems arising from a

perennial rootstock. One specimen (*George* 13939) is sterile and has somewhat larger leaves than other specimens and is possibly from a plant surviving from the previous wet season. Map 9.

Affinities: The species is related to *D. stipatum* which has a similar life-form, but is certainly distinct. *D. cheelii* has leaflets with veins prominently depressed on the upper surface of the leaflets, usually short leaf-rachises, usually narrower leaflets, shorter pedicels, bracts and bracteoles, and pods with fewer articles. The geographic ranges of the two species do not overlap.

4. *Dendrolobium stipatum* S.T. Blake, Austr. J. Bot. 2:117 t.2 (1954). **Type:** E mouth of Daly River, 13°23'S 130°32'E, July 1946, *S.T. Blake* 16670 (holo:BRI; iso:BRI, K).

Holtzia umbellata Schindl., Rep. sp. nov. reg. veg. 22:285 (1926). **Type:** N. Australia, in 1891, *M. Holtze* (iso:K).

Subshrub to c. 1 m high, tufted stems from perennial rootstock; branches with indumentum of moderately dense to dense appressed hairs 0.2–0.4 mm long; stipules triangular, 2–5.5 mm long, 2 mm wide at base, striate, pubescent outside. Leaves 1- or 3- foliolate; leaflets oblong, elliptic or ovate, obtuse or retuse, sparsely appressed pubescent on both surfaces, the hairs c. 0.2 mm long, 6–10 prominent lateral veins on each side of midrib; terminal leaflet 38–65 mm long, 17–45 mm wide, 1.8–2.3 times longer than wide, laterals smaller, 23–45 mm long, 11–20 mm wide, 1.7–2.3(–2.8) times longer than wide; rachis 1–12 mm long, petiolules 1.5–2.5 mm long, stipels about as long as the petiolules; petioles 4–14 mm long. Flowers in fascicles of up to c. 12 in the upper axils, sessile or on peduncles to 6 mm long; bracts 1–3 mm long; pedicels 6–16 mm long, bracteoles at base of calyx, 1–1.5 mm long. Flowers: calyx c. 4 mm long with \pm appressed hairs c. 0.3 mm long and short erect uncinat hairs, tube 2–2.2 mm long; corolla pink, the standard whitish in the upper half, concave, oblong c. 10 mm long, 6 mm wide on claw c. 1 mm long; keel petals about as long as the wings; ovary appressed pubescent. Pods curved with

4–6 articles, each oblong, 6–8 mm long, 3.5–5 mm wide, appressed pubescent. Seeds not seen.

Other specimens: Northern Territory. Old Litchfield Road, 13°32'S 130°54'E, Sep 1975, *Dunlop* 3588 (DNA, K); Woodcutters track, 50 miles [80 km] S of Darwin, Sep 1970, *Byrnes* 1991 (DNA, K); Batchelor, Sep 1913, *Hill* 7023/13 (NSW).

Distribution and habitat: *Dendrolobium stipatum* is restricted to a small area in the north of the Northern Territory where it occurs on sandy soils in eucalypt woodland. Map 10.

Affinities: The species is closely related to *D. cheelii*; differences between them are discussed under the latter. Blake compared *D. stipatum* with *D. umbellatum* but acknowledged that it differed sharply from that species.

5. *Dendrolobium umbellatum* (L.) Benth. in Miquel, Pl. Jungh. 216 & 218 (1852); Miquel, Fl. Ind. Bat. 1:262 (1855); Ohashi, Ginkgoana 1:82 (1973); Pedley, Rev. Handb. Fl. Ceylon 10: 162 (1996); *Desmodium umbellatum* (L.) DC., Prodr. 2:325 (1825); Benth., Fl. Austr. 2:230 (1864); Prain J. Asiatic Soc. Bengal 66:387 (1897); Schubert, Fl. Trop. East Africa Legum.: Papilion.: 455 (1971); Lui & Chuang, Taiwania 8:98 (1962); *Hedysarum umbellatum* L., Sp. Pl.: 747 (1753). **Type:** Herb. Hermann vol. 2 fol. 26, No.293 (lecto: BM, *fide* Pedley in Turland & Jarvis (1997)).

Aeschynomene arborea L., Sp. Pl.: 713 (1753). **Type:** Sri Lanka: N. of Trincomalie, 1 September 1931, *N.D. Simpson* 8516 (BM, neotype, *fide* Pedley in Turland & Jarvis (1997)).

Two varieties are recognised.

5a. *Dendrolobium umbellatum* (L.) Benth. var. *umbellatum*

Branches and pedicels with indumentum of silky appressed hairs, becoming sparse; leaflets ovate or elliptic, sparsely appressed pubescent beneath, the hairs minute; pods sparsely appressed pubescent.

Selected specimens: Queensland. COOK DISTRICT: Boigu Is., 9°14'S 142°13'E, Oct 1981, *Clarkson* 3870 (BRI, K, MBA); Endeavour River, Aug 1820, *Cunningham* 88

(BM, K); Barnard Is. (no 2), Jun 1848, *McGillivray*. Voy. of 'Rattlesnake' Bot. 284 (K); NORTH KENNEDY DISTRICT: Cardwell, c. 18°10'S 146°00'E, Aug 1963, *Blake* 22070 (BRI, K, MEL); Daydream (West Molle) Is, 20°15'S 148°49', Jun 1984, *Pedley* 5220 (BRI, MEL).

5b. *Dendrolobium umbellatum* var. *hirsutum* (DC.) Pedley, comb. nov. *Desmodium umbellatum* var. *hirsutum* DC., Prodr. 2:325 (1925); *Dendrolobium umbellatum* f. *hirsutum* (DC.) Ohashi Ginkgoana 1:84 (1973). **Type:** Calcutta Botanic Gardens, Wallich 5687D (iso:K)

Branches and pedicels densely hirsute; leaflets almost orbicular, densely hairy beneath; pods with ± persistent long yellowish hairs.

This variety does not occur in Australia.

Distribution and habitat: In Australia *D. umbellatum* var. *umbellatum* occurs along the east coast, north of about Mackay (22°S), usually on sand, often in dense stands above high-water mark, though sometimes on rocks or forming a fringe behind mangroves. It does not occur on the western shore of Cape York Peninsula nor farther west in the Northern Territory or Western Australia. Outside Australia, the variety extends into the Pacific (Melanesia as far east as Tonga, Samoa and Micronesia) and through Malesia to Taiwan, southern China, Indo-China, the Andaman Is., Peninsular India, Sri Lanka to east Africa. Map 11.

Dendrolobium umbellatum var. *hirsutum* is found in Madagascar and the Mascarene Islands. Ohashi in making the combination *Dendrolobium umbellatum* f. *hirsutum* cited only cultivated specimens and stated that its native habitat was unknown.

Affinities: *Dendrolobium umbellatum*, *D. arbuscula*, *D. quinquepetalum* and *D. triangulare* are closely related but their relationship to other species is uncertain. The wide geographic range of *D. umbellatum* could indicate it to be less advanced than the other species all of which (except for *D. triangulare* and possibly *D. quinquepetalum*) have restricted ranges and which may have been derived from it. Its occurrence on sea-shores and its thick-walled pod articles seemingly adapted to dispersal by water could, however,

point to the wide distribution of the species regardless of its level of advancement.

Ohashi (1973:85) noted the great variability of *D. umbellatum* but could not find any distinctive local assemblages. However, he did distinguish *D. umbellatum* f. *hirsutum* (DC.) Ohashi, based on *Desmodium umbellatum* var. *hirsutum* DC., which was described from a plant grown in the Calcutta Botanic Gardens. *D. umbellatum* from Madagascar, Mauritius and Reunion is the same as *D. umbellatum* f. *hirsutum*. It has densely hirsute branches and pedicels, almost orbicular leaflets densely hairy and prominently veined on the lower surface, and pods with more or less persistent long yellowish hairs, and is distinct enough to warrant varietal rank.

6. *Dendrolobium arbuscula* (Domin) Ohashi, Taiwania 42:137 (1997).

Desmodium arbuscula Domin, Biblioth. Bot. 89:211 (1926). **Type:** Queensland. In xerodrymio ad Chillagoe, *Domin* '4764' (lecto: PR 527346, chosen here).

Dendrolobium sp. (Mt Scatterbrain J.R. Clarkson+ 6708) Pedley in Henderson (ed.): Queensland Plants: Names and Distribution: 79 (1997).

Shrub or small tree, in Australia up to 6 m tall but reported to reach 12.5 m in New Guinea (*Pullen* 6992; BRI, CANB, K); bark soft, grey; branchlets covered with rather dense appressed white hairs, occasionally somewhat retrorse, 0.3–0.5 mm long; stipules to 10 mm long, deciduous. Leaves 3-foliolate; leaflets oblong, elliptic or obovate, rounded or sometimes attenuate at the base, obtuse or subacute at the apex, margins tending to be slightly recurved, glabrous or with sparse appressed hairs on upper surface, sparse to moderately dense, appressed or slightly ascending hairs on the lower, c. 10 lateral veins prominent on each side of midrib; terminal leaflet 30–65 mm long, 16–32 mm wide, laterals smaller, 20–50 mm long, 9–17(–24) mm wide, both (1.4–)1.8–2.6 times longer than wide; stipules 1.5–4 mm long, usually about as long as petiolules, 1.5–3.5 mm long; rachis 5–9 mm long; petioles 9–16 mm long. Flowers in condensed, umbellate, axillary

racemes, sessile or peduncle up to 8 mm long; bracts 3–4 mm long, pedicels c. 2 mm long, bracteoles 2.5–3.5 mm long. Flowers: calyx 5.5–8 mm long, tube c. 3 mm long, upper lobe shortly bifid at apex, 2.5–3.5 mm long, c. 1.5 mm wide at base, lateral lobes 3–3.2 mm long, lower lobe acuminate, 4.5–5 mm long, all c. 1 mm wide; corolla white, occasionally with a green area at the base of the standard; standard orbicular, 9–10 mm long (7–)8–11 mm wide on claw 1.5–2 mm long; wings (5.5–)9–11 mm long, (2–)3.3– mm wide, auriculate at the base, on a claw 1.5–2 mm long; keel slightly shorter than wing petals. Pods with 2 or 3 articles; articles oblong, 4–6 mm long, 3.5–4 mm wide with sparse appressed hairs 0.1–0.2 mm long. Seeds not seen.

Selected specimens: **Papua New Guinea.** Between Dabora and Cape Vogel Peninsula, Apr 1953, *Brass* 21875 (K); vicinity of Rigo, Central District, Aug 1962, *Schodde* 2699 (CANB, K, L); Mori R., c. 15 km NE of Rodney, Central District, Aug 1969, *Pullen* 8132 (CANB, K, L). **Queensland.** COOK DISTRICT: 17 miles [27 km] SW of Coen, Aug 1966, *Story* 7927 (CANB, K); Chillagoe, alt. 360m, Jan 1931, *Hubbard & Winders* 6794 (BRI, K); 4-mile Creek, Alma-den, alt. 450m, 17°20'S 144°35'E, Jan 1972, *Hyland* 5818 (BRI, K, QRS).

Distribution and habitat: The species occurs on limestone outcrops, in dry rainforest and in eucalypt woodland often on margin of rainforest from c. 18°S lat. through Cape York Peninsula to Papua New Guinea in the vicinity of Port Moresby and eastward. It has also been recorded from Fiji (Ohashi 1997a). Map 12.

Affinities: Despite its position close to *D. multiflorum* in the key to species, *D. arbuscula* is related not to *D. multiflorum* but to *D. umbellatum* and *D. quinquepetalum* (Blanco) Merr. Knaap-van Meeuwen (1962) referred four specimens (*Brass* 8789, *Carr* 11845, NGF 4225 from New Guinea and *Hubbard & Winders* 6794 from Queensland) with some doubt to *Desmodium quinquepetalum*. Verdcourt (1979: 411) accepted the New Guinean specimens cited by Knaap-van Meeuwen as mere variants of *Desmodium umbellatum*. Ohashi (1997a) pointed out differences between *D. arbuscula* and *Dendrolobium quinquepetalum* and referred all four specimens to *D. arbuscula*. NGF 4228 is not a good specimen and difficult to identify

but I agree with Ohashi's placement of the other specimens.

D. arbuscula differs from *D. quinquepetalum* in leaflets not acuminate with veins not prominent beneath, both calyx and corolla somewhat smaller, the lower lobe of the calyx longer than the others by 1 mm or more, and small, less pubescent articles of the pod. From *D. umbellatum* it differs in its leaflets smaller, more coriaceous and tendency to shine on the upper surface, and, contrary to its protologue, wing petals longer than the keel and about as wide.

Though *D. quinquepetalum* has apparently been excluded from the flora of New Guinea, one specimen from the island (Laloki River, June 1926, Brass 1654 (BRI, K)) probably represents an undescribed species closely related to it.

Desmodium Desv., J. Bot. Agric. 1:122 t.5 (1813), nom. conserv.; Benth. in Miq., Pl. Jungh. 220 (1852); Hutchinson, Gen. Fl. Pl. 1:481 (1964); Ohashi, Ginkoana 1:87 (1973) – with synonyms listed, except *Holtzea* Schindler which is *Dendrolobium*; Smith, Fl. Viti. Nova 3: 188 (1985); Pedley, Rev. Handb. Fl. Ceylon 10:196 (1996). Type: *Desmodium scorpiurus* (Sw.) Desv.

Note: Most other published descriptions of *Desmodium* (for example, Schubert (1971), Verdcourt (1979)) are quite wide and include the genera *Aphyllodium*, *Dendrolobium*, *Phyllodium* and *Tadehagi* which are treated here as distinct.

A genus of some 300 species distributed mainly through the subtropics and tropics with perhaps half the species in Mesoamerica.

Bentham (1852, 1865b) is the only person to have published an infrageneric classification. He probably saw specimens of fewer than half the currently accepted species and these, because of a preponderance of specimens from British colonies, mainly from the Old World. Consequently his treatment of New World species is rather sketchy. Schindler, whose annotations of specimens and his publications

from 1911 to 1928 suggest that his knowledge of the Desmodieae was unsurpassed, and who had a narrow concept of *Desmodium*, recognised the segregate genera of Bentham (1852), and described others. Some were recognised by Hutchinson (1964), Ohashi (1973) and Ohashi et al. (1981). Ohashi (1973) compared the different treatments.

Schindler never proposed a complete infrageneric classification of *Desmodium* and *Meibomia* which he treated as distinct genera, though he did recognise several subgenera and sections. Ohashi (1973) proposed a new classification of *Desmodium* and allied genera. His study was 'intended to delimit all the Asiatic species of the genus *Desmodium* and its allied genera as well as these genera themselves'. Since he considered less than a fifth of the total number of species of *Desmodium* over only part of its range, it might be expected that his classification would have only limited application. However, because south-eastern Asia is the centre of generic diversity (but not of speciation) of the Desmodiineae and has few species in common with the New World, Ohashi's classification can stand alone. Consideration of New World species would probably lead to the recognition of additional subgenera and sections rather than the modification of those already proposed; that is, a classification of American species could be added to Ohashi's classification with minor disturbance.

Ohashi treated only 14 Australian species, those that occur in Asia or Malesia as well, and his classification requires minor modification to accommodate all the Australian species. The classification is set out below. Four recently introduced American species, *D. incanum*, *D. intortum*, *D. tortuosum* and *D. uncinatum* have not been classified. Alterations to Ohashi's classification are:

1. Description of a new subgenus to accommodate *D. acanthocladum*.

Desmodium subg. **Acanthocladum** Pedley, **subg. nov.** Frutex; ramuli in spinis brevibus immutati; inflorescentia brevia usque 4 nodis constructa; bracteolae et bractae primariae secundariaeque

praesentae; legumen usque 7 articulis, aliquot plerumque abortis constructus, unusquisque c. 10 mm longis, 4–4.5 mm latis. **Typus:** *Desmodium acanthocladum* F. Muell.

Shrub; branchlets modified into short spines; inflorescence short with up to 4 nodes; primary and secondary bracts and bracteoles present; pod with up to 7 articles, some usually aborted, each c. 10 mm long, 4–4.5 mm wide.

2. Transfer of *Alysicarpus* sect. *Desmodiopsis* Schindl. to *Desmodium* (subg. *Sagotia*), with *Desmodium campylocaulon* F. Muell. ex Benth. the only species

***Desmodium* sect. *Desmodiopsis* (Schindl.) Pedley, comb. nov.**

Alysicarpus sect. *Desmodiopsis* Schindl., Rep. sp. nov. reg. veg. 21:14 (1925).
Type: *Desmodium campylocaulon* F. Muell. ex Benth. (*Alysicarpus campylocaulos* (F. Muell. ex Benth.) Schindl.).

3. Recognition of (a) ser. *Stenostachys* and (b) ser. *Arillata*, both sufficiently distinct from the type of sect. *Sagotia*, *D. triflorum*, to warrant acceptance

a. *Desmodium* ser. *Stenostachys* (Schindl.) Pedley, stat. nov.

Desmodium sect. *Stenostachys* Schindl., Rep. sp. nov. reg. veg. 22:255 (1926).
Lectotype: *Desmodium filiforme* Zoll. & Moritzi

Annual herbs; leaves 1- or 3-foliolate, often on same plant; leaflets dimorphic; inflorescences long, sparsiflorous, terminal and/or axillary; flowers single, or rarely in pairs along the rachis; secondary bracts and bracteoles absent; pods with upper suture continuous or notched between articles; seed with small rim aril only.

b. *Desmodium* ser. *Arillata* Pedley, ser. nov.
Herbae perennes; folia 1- et 3-foliolata, rhachide saepe petiolo longiore; inflorescentia terminalia, plerumque 3–10-flora, compacta, saepe in frondibus tecta; legumen suture supra undulata,

inferna crenata praeditum, ita inter articulos constrictum; semen arillo bene evoluto simili eiei *Codariocalycis motorii* (Houtt.) Ohashi ornatum. **Typus:** *Desmodium microphyllum* (Thunb.) DC.

Perennial herbs; leaves 1- and 3-foliolate, rachis often longer than the petiole; inflorescence terminal, usually 3–10-flowered, compact, often hidden in foliage; upper suture of pod undulate, lower crenate, hence pod constricted between articles; seeds with well developed aril similar to that of *Codariocalyx motorius* (Houtt.) Ohashi.

4. Recognition of *Sagotia* at the rank of series

***Desmodium* ser. *Sagotia* (Duchass. & Walpers) Pedley, comb. et stat. nov.**

Sagotia Duchass. & Walpers, Linnaea 23:737 (1850).

Perennial herb; leaves 3-foliolate; inflorescence an axillary or usually a leaf-opposed 2–5 flowered fascicle, sometimes fascicles arranged in short racemes; upper suture of pod continuous; seed with small rim aril only. **Type:** *Desmodium triflorum* (L.) DC. (*Sagotia triflora* (L.) Duchass. & Walpers).

Systematic arrangement of *Desmodium* Desv. in Australia.

subg. *Hanslia* (Schindl.) Ohashi

1. *D. ormocarpoides* DC

subg. *Acanthocladum* Pedley

2. *D. acanthocladum* F. Muell.

subg. *Desmodium*

3. *D. scorpiurus* (Sw.) Desv.

subg. *Sagotia* (Duchass. & Walpers) Baker

sect. *Oxytes* (Schindl.) Ohashi

4. *D. brachypodium* A. Gray

sect. *Desmodiopsis* (Schindl.) Pedley

5. *D. campylocaulon* F. Muell. ex Benth.

- sect. *Sagotia* (Duchass. & Walpers.) Benth. 19. *D. strigillosum* Schindl.
- ser. *Arillata* Pedley 20. *D. nemorosum* F. Muell. ex Benth.
6. *D. microphyllum* (Thunb.) DC. 21. *D. tiwiense* Pedley
- ser. *Sagotia* (Duchass. & Walpers) Pedley sect. *Heteroloma* Benth
7. *D. triflorum* (L.) DC. 22. *D. velutinum* (Willd.) DC.
8. *D. heterophyllum* (Willd.) DC. 23. *D. gangeticum* (L.) DC.
- ser. *Stenostachys* (Schindl.) Pedley 24. *D. rhytidophyllum* F. Muell. ex Benth.
9. *D. pycnotrichum* Pedley 25. *D. tenax* Schindl.
10. *D. trichostachyum* Benth. 26. *D. macrocarpum* Domin
11. *D. filiforme* Zoll. & Moritzi 27. *D. gunnii* Benth. ex J.D. Hook.
12. *D. brownii* Schindl. 28. *D. varians* (Labill.) D. Don
13. *D. flagellare* Benth. Introduced American species, position not defined:
14. *D. hannii* Schindl. 29. *D. tortuosum* (Sw.) DC.
15. *D. muelleri* Benth. 30. *D. uncinatum* (Jacq.) DC.
16. *D. glareosum* Pedley 31. *D. intortum* (Mill.) Urban
17. *D. pullenii* Pedley 32. *D. incanum* DC.
- sect. *Nicolsonia* (DC.) Benth.
18. *D. heterocarpon* (L.) DC.

Key to species of *Desmodium* in Australia

1. Disk around base of ovary; stigma lateral; articles of pod 17–20 mm long;
scandent shrubs **1. *D. ormocarpoides***
- Disk absent; stigma terminal; articles of pod less than 12 mm long; herbs
or shrubs, not scandent 2
2. Woody shrub with spinescent branches; inflorescences axillary, up to 12
mm long with up to 4 fascicles of flowers; bracteoles present; pods of
4–6 articles, each 9–11 × 4–4.5 mm, some usually aborted **2. *D. acanthocladum***
- Herbs or shrubs, not spinescent; inflorescences terminal or axillary,
usually longer; bracteoles absent; articles usually smaller, not
significantly aborted 3
3. Stipules persistent, distinctly auriculate at the base on the side further away
from the petiole 4
- Stipules persistent or not, mostly symmetrical at the base, or if asymmetric
then not auriculate 6
4. Erect annual; young pods twisted; mature articles with margins alternately
involute and revolute **29. *D. tortuosum***

- Sprawling or prostrate perennial herb; young pods not twisted,
mature articles with plane margins 5
5. Leaves drying blue-black, sometimes with 5 leaflets; pod-articles
semicircular, 4×3 mm **3.D. brachypodum**
Leaves not drying blue-black, 3-foliolate; pod articles narrowly oblong
elliptic, $4-5 \times 1-2$ mm **4. D. scorpiurus**
6. Flowers large: calyx 6 mm or more long, lowest lobe c. 5 mm long; standard
c. 1 cm long; pod shortly stipitate; stamens monadelphous, the upper
stamen separating as pods develop 7
Flowers smaller: calyx less than 6 mm long, lobes less than 5 mm long;
standard to c. 8 mm long; pod sessile; stamens diadelphous 8
7. Pod articles 5×3 mm; leaflets often with pale central zone along midrib
..... **30. D. uncinatum**
Pod articles 4×2 mm; leaflets uniformly green above **31. D. intortum**
8. Pod articles inflated; leaves lanceolate to narrow ovate, 4–7 (–11) cm long,
4–7.5 (–10) times longer than wide **5. D. campylocaulon**
Pod articles flat; leaves smaller and/or less elongate 9
9. Upper calyx lobes connate at their base, united up to about half
their length, hence calyx subequally 5-lobed; inflorescences open;
pedicels often more than 5 mm long, filiform; secondary bracts absent;
plants herbaceous 10
Upper calyx lobe entire or bifid but not divided beyond the middle, hence,
calyx 4-lobed; inflorescence often dense; pedicels often less than 5 mm
long; secondary bracts often present; plants herbaceous or woody 21
10. Flowers in few-flowered axillary or leaf-opposed fascicles or in short
3–10-flowered terminal inflorescences, the inflorescences obscured by
foliage 11
Flowers single (rarely in pairs) in open terminal inflorescence projecting
from foliage. 13
11. Inflorescence terminal; lateral leaflets $2.5-6 \times 1.2-2.2$ mm, usually 2–3
times longer than wide; both upper and lower sutures of pod incised;
seed with well developed aril **6. D. microphyllum**
Flowers in axillary or leaf-opposed fascicles; lateral leaflets more than
3 mm wide and less than 3 times longer than wide; upper suture of pod
straight; seed with rim aril only 12
12. Terminal leaflet cuneiform, 4–7.5 mm long; pedicels 5–8 mm long **7. D. triflorum**
Terminal leaflet elliptic or obovate, 10–27 mm long; pedicels 10–20 mm
long **8. D. heterophyllum**
13. Upper suture of pod distinctly notched between articles; nerves of articles
anastomosing, radiating from raised central area where anastomoses are
small and \pm equilateral; nerves often purplish 14
Upper suture of pod continuous, not distinctly notched between articles;
nerves of articles \pm transverse, anastomoses \pm elongate not radiating
from central raised area; nerves not purplish 17

14. Leaves 1- and/or 3-foliolate; leaflets depressed ovate, orbicular or cuneiform 15
 Leaves usually 3-foliolate, terminal leaflet obovate, oblong or linear 16
15. Leaves 3-foliolate; leaflets cuneiform; ovary and articles (at least when young) with clavate trichomes **9. *D. pycnotrichum***
 Leaves 1- and/or 3-foliolate; leaflets cuneiform, depressed ovate or orbicular; ovary and pod glabrous or with sparse uncinata hairs . **10. *D. trichostachyum***
16. Terminal leaflet oblong, 10–35(–45) mm long, usually more than 3.5 mm wide, 1–5(–7) times longer than wide; rachis of inflorescence usually with long spreading hairs; plant prostrate **11. *D. filiforme***
 Terminal leaflet linear, narrow lanceolate or narrow oblong, 10–50(–65) mm long, usually less than 4 mm wide, 3.5–13 times longer than wide; rachis (at least in upper part) without long spreading hairs; plant erect . . . **12. *D. brownii***
17. Pods with 2 (or 3) articles; articles 4.2–5 mm long; leaves usually 3-foliolate; terminal leaflet oblong or obovate, 12–40 × 10–24 mm, 1.1–1.7 times longer than wide **13. *D. flagellare***
 Pods with 4–6 articles; articles 2.5–4.2(rarely –5 mm) long; leaves 1- or 3-foliolate; largest leaflet shorter, narrow or more elongate 18
18. Pod distinctly curved; articles (2.5–)2.8–4.2(–5) mm long; leaflets orbicular (when 1-foliolate) or obovate or cuneiform (when 3-foliolate), usually less than 1.5 times longer than wide **14. *D. hannii***
 Pods straight; articles sometimes shorter; terminal (or single) leaflet oblong, obovate-oblong, usually 1.5–4.5 or more times longer than wide 19
19. Articles (3.5–)4–5 × 3–4 mm; largest leaflet of leaf widest below the middle, glabrous, or almost so, on upper side **15. *D. muelleri***
 Articles 2.5–3.5 × 2.2–3.3 mm; largest leaflet oblong or obovate, not widest below the middle, usually pubescent on upper surface 20
20. Hairs of upper surface of leaf usually weak, ascending; of stems usually weak and ascending, white, up to 1 mm long; largest leaflet usually less than 5 mm wide **16. *D. glareosum***
 Hairs of upper surface of leaflets appressed, occasionally somewhat ascending; of stem stiff, yellow, curved ascending; largest leaflet usually more than 5 mm wide **17. *D. pullenii***
21. Leaves on individual plants predominantly 1-foliolate, occasionally with a few 3-foliolate leaves 22
 Leaves on individual plants predominantly 3-foliolate, sometimes, particularly on young plants, mixed with 1-foliolate leaves 25
22. Leaflet broadly ovate, 6–12.5 × 4–8.5(–10.5) cm, lower surface velutinous, upper surface pubescent **22. *D. velutinum***
 Leaflet oblong, elliptic, ovate or orbicular, 1.7–8.5 (rarely –16) × 1–6(–8.5) cm, glabrous or almost so on upper surface, appressed pubescent on lower surface 23
23. Leaflet elliptic to ovate, acutish; secondary bracts present; pod deeply incised; articles 2.5–3 × 2–2.5 mm; pedicels to 4 mm long **23. *D. gangeticum***
 Leaflet oblong, elliptic or orbicular, obtuse; secondary bracts absent; pods

- shallowly incised, articles 3 mm or more long and wide; pedicels 2–3 mm long 24
24. Leaflet more or less orbicular, subcordate at base; pod-articles 3–3.5 × 3–3.5 mm **21. D. tiwiense**
 Leaflet oblong-elliptic, rounded at base; pod articles c. 5 × 3.5 mm **20. D. nemorosum**
25. Primary bracts dense and entirely covering flower buds, the young inflorescence therefore like coniferous strobiles; upper suture of pod straight or slightly undulate, lower shallowly constricted, hence isthmus usually more than half width of pod. 26
 Primary bracts usually triangular or narrowly ovate, not entirely covering flower buds; upper suture of pod undulate to distinctly incised, lower suture deeply constricted, hence isthmus usually less than half width of pod. 28
26. Inflorescence open when mature; pedicels spreading or decurved in fruit; pod-articles c. 5 × 3.5 mm **20. D. nemorosum**
 Inflorescence dense when mature; pods erect, ascending or deflexed, often obscuring rachis; pod articles 2.5–3 × 1.8–3 mm 27
27. Pods erect or ascending; terminal leaflet obovate, sometimes narrow; axis of inflorescence either with rather spreading uncinata hairs or with stiff yellowish appressed hairs **18. D. heterocarpon**
 Pods deflexed; terminal leaflet lanceolate to oblong; axis of inflorescence shortly appressed pilose **19. D. strigillosum**
28. Plants rather densely pubescent; branchlets and at least undersides of leaves with spreading hairs 29
 Plants not densely pubescent; branchlets and undersides of leaves glabrous or with sparse appressed hairs. 32
29. Stipules 3–11 mm long, united at base, at least when young. **32. D. incanum**
 Stipules to c. 6 mm long, free 30
30. Terminal leaflet to 60 mm long; articles of pod 3.5–4 × 2.5–3 mm; trailing or sprawling plant **24. D. rhytidophyllum**
 Terminal leaflet more than 60 mm long; articles of fruit more than 5 mm long, ± erect plants 31
31. Leaflets ovate with long acute apex; upper surface with sparse appressed to ascending hairs; articles 5.5–8 × 3.4–4 mm **25. D. tenax**
 Leaflets ovate or rhombic, obtuse, mucronulate, with moderately dense stiff hairs on both surfaces; articles 9–10 × 5–6 mm **26. D. macrocarpum**
32. Leaves subdigitate; leaflets cuneiform and truncate at the apex or rarely broadly obovate and rounded; pod articles 4–5 × 2–2.5 mm **27. D. gunnii**
 Leaves usually with distinct rachis 2–4.5 mm long; leaflets lanceolate, oblong or rarely oblanceolate; pod articles 3.5–4.2 × 2.7–3.8 mm **28. D. varians**

- 1. *Desmodium ormocarpoides* DC.**, Prodr. 2:327 (1825); Desvaux, Mém. Soc. Linn., Paris 4:307 (1825); Ohashi, Ginkgoana 1:113 (1973); Verdcourt, Man. New Guinea Leg: 403 (1979). Based on *Hedysarum adhaerens* Poir., in Lamarck, Encycl. Méth. Suppl 5:15 (1817), nom illeg., non Vahl (1791); *Hanslia adhaerens* (Poir.) Schindl., Rep. sp. nov. reg. veg. 20:277 (1924) **Type:** 'Cette plante a été découverte à l'île de Java par M. de Labillardiere' (P?, n.v.)

Desmodium dependens Blume ex Miq., Fl. Ind. Bat. 1:248 (1855). **Type:** Molukscheilanden. Nieuw Guinea' (n.v.)

Selected specimens: Queensland. COOK DISTRICT: Alligator Creek Catchment, 12°35'S 143°20'E, Oct 1972, Hyland 6440 (BRI, K); Shiptons Flat, 15°48'S 145°14'E, Oct 1973, Webb & Tracey 13643 (BRI, CANB). NORTH KENNEDY DISTRICT: Rockingham Bay, Dallachy (MEL); Port Denison, in 1874, Fitzalan (MEL).

Distribution and habitat: The species occurs in rainforest, usually in disturbed situations such as along logging tracks. It ranges from the central Queensland coast through New Guinea to central Malesia. It is not common in Australia. Map 13.

Affinities: *D. ormocarpoides* is a well defined species isolated in the genus. Schindler referred it to his monospecific genus *Hanslia* which Ohashi reduced to subgeneric rank within *Desmodium*. It is characterised by its stipitate pods composed of slightly turgid, narrowly obovate articles, the minute tubular disk around the base of the ovary, the lateral stigma and the bracteoles at the base of the calyx.

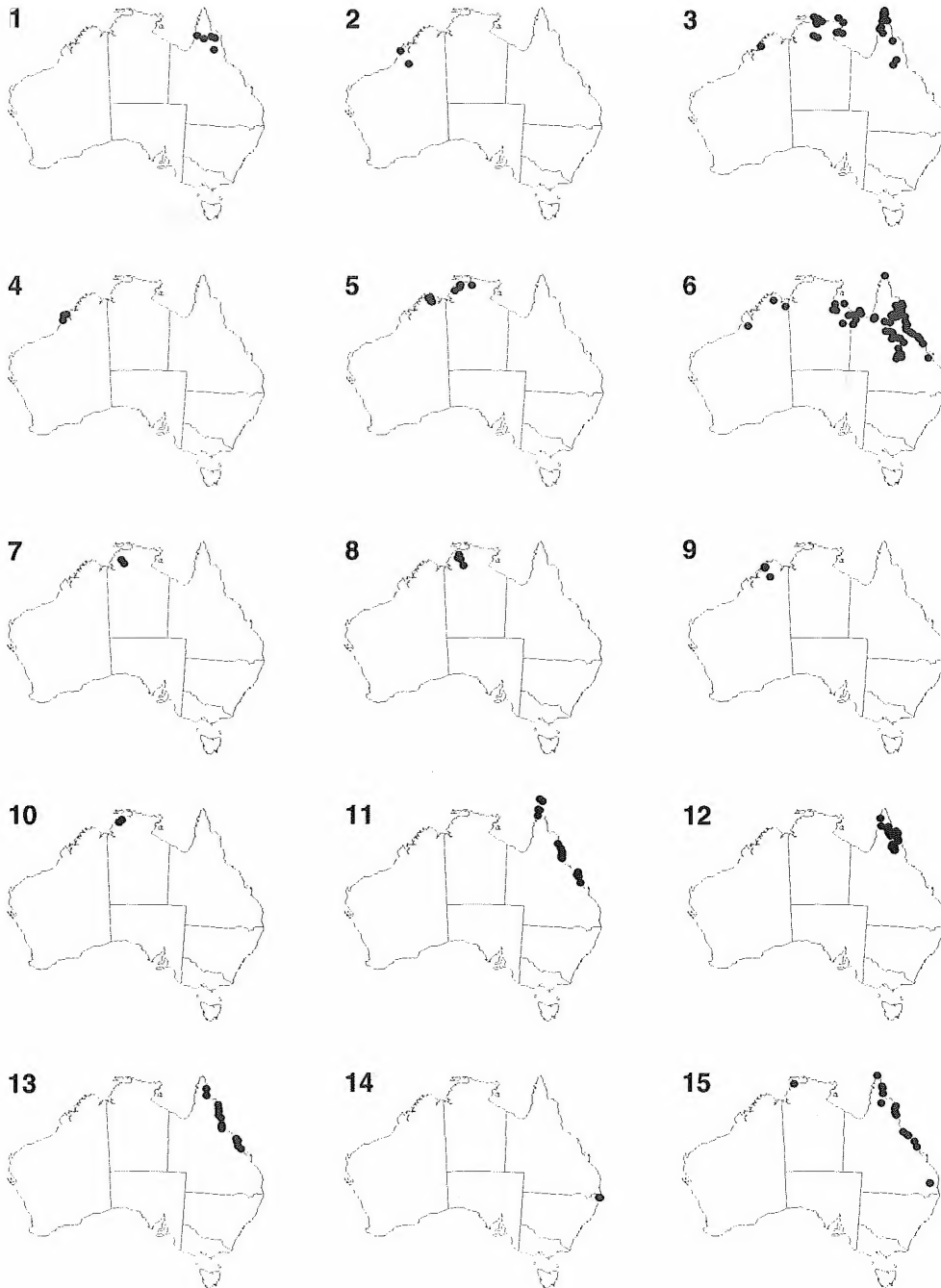
- 2. *Desmodium acanthocladum* F. Muell.**, Fragm. Phytog. Austr. 2:122 (1861); Benth., Fl. Austr. 2:23 (1864); C. Muell. in Walpers, Ann. Bot. 7:764 (1870); Steen. & Veldk., Reinwardtia 10:24 (1982); *Dicerma acanthocladum* F. Muell., loc. cit., pro. syn; *Meibomia acanthoclada* (F. Muell.) Kuntze; Rev. Gen. 1:197 (1891). **Type:** Clarence River, Beckler (holo: MEL; iso: K).

Woody shrub to 2 m tall; branchlets (many modified into short thorns) angular with

yellowish ribs running from the bases of stipules, glabrous; stipules deltoid, 1–2 mm long, veined. Leaves trifoliolate, coriaceous; petioles sulcate, 1–4 mm long; rachis 0.6–2.3 mm long; petiolules 0.3–0.5 mm long; stipels setaceous, about as long as the petiolules; terminal leaflet oblanceolate and obtuse or narrowly elliptic and acute, the laterals oblong or obovate, acute or obtuse, all glabrous and slightly shining above or with scattered short hairs and paler beneath, the terminal ones 12–28 mm long, 3–5.5 mm wide, 3–6 times longer than wide; laterals smaller, 7–18.5 mm long, 3–5 mm wide, 2–3.6 times longer than wide. Flowers pink or mauve in fascicles of 2 or 3 along an axillary axis, up to 4-noded and 12 mm long; primary bracts c. 1 mm long, secondary bracts similar, shorter; pedicels 2–3 mm long with bracteoles 0.6–1 mm long at top of pedicel; calyx campanulate, 4-lobed, 3–4 mm long with scattered appressed hairs, the upper lip notched at the tip, 1.8–2 mm long, the lateral and lower ones apiculate with thickened tips, 1–1.3 mm long. Corolla longer than the calyx: keel orbicular, shortly clawed, 6.5–7 mm long, 6–7 mm wide; wings oblong, obtuse 7–8 mm long, 2.3–3 mm wide, auriculate at the base, on a claw 1.5–2 mm long, keel petals 6.5–8 mm long, 2.3–3 mm wide, auriculate on claw 2–2.5 mm long; stamens diadelphous; ovary minutely uncinately hairy. Pods with 2–6 (7) articles, some usually aborted and occasionally appearing stipitate when the proximal article is aborted, upper suture shallowly indented, the lower margin deeply indented, the isthmus c. 1/6 width of pod. Articles ± reticulately longitudinally veined, with moderate indumentum of hooked hairs, 9–11 mm long, 4–4.5 mm wide; seeds obliquely oblong, c. 6 mm long, 3.5 mm wide, rim aril small.

Selected specimens: New South Wales. NORTH COAST: Boat Harbour Flora Reserve, 17 km NE of Lismore railway station, 28°47'S 153°30'E, Feb 1989, Coveny 10651 (K, NSW); Wilsons River at Lismore, 28°48'S 153°17½'E, Feb 1987, Pullen 11139 (BRI, K, NSW).

Distribution and habitat: The species is confined to the North Coast division of New South Wales where it occurs on the fringes of riverine rainforest. It was probably more widely distributed before extensive clearing of the land, but apparently viable populations occur in flora reserves. Map 14.



1. *Aphyllodium latifolium*
4. *Aphyllodium glossocarpum*
7. *Dendrolobium multiflorum*
10. *Dendrolobium stipatum*
13. *Desmodium ormocarpoides*

2. *Aphyllodium parvifolium*
5. *Aphyllodium stylosanthoides*
8. *Dendrolobium polyneurum*
11. *Dendrolobium umbellatum*
14. *Desmodium ancanthocladium*

3. *Aphyllodium schindleri*
6. *Aphyllodium biarticulatum*
9. *Dendrolobium cheelii*
12. *Dendrolobium arbuscula*
15. *Desmodium scorpiurus*

Affinities: The relationships of the species are uncertain. Bentham (1864) dismissed Mueller's association of it with *Desmodium biarticulatum* (L.) F. Muell. (= *Aphyllodium biarticulatum*) and stated 'it is otherwise more nearly allied to the section *Heteroloma* subsect. *Podocarpa*'. Ohashi (1973) referred most species of subsect. *Podocarpa* to subg. *Podocarpium* (Benth.) Ohashi. *D. acanthocladum* differs from species of subg. *Podocarpium* in its woody habit, thorny branchlets, short axillary inflorescences, bracteoles and diadelphous stamens. This combination of characters excludes it from other subgenera treated by Ohashi, and it has therefore been placed in the newly described, monotypic subg. *Acanthocladum* (see p. 225).

Its resemblance to *Trifidocanthus unifoliolatus* Merr. (*Desmodium unifoliolatum* (Merr.) Steen.) is due mainly to its 'ecotaxonomical character' (Steenis & Veldkamp, 1982), its thorns. Otherwise it is not related to the other species.

3. ***Desmodium scorpiurus*** (Sw.) Desv., J. Bot. Agric. 1:122 (1813); Schubert, in McBride, Field Mus. Nat. Hist. Publ. Ser. 13 (3,1):433 (1943); Verdcourt, Man. New Guinea Leg.: 407 t.94 (g) (1979); Howard, Fl. Lesser Antill., Leeward & Windward Is. 4(1):482 (1988); Smith Fl. Vitiensis Nova 3:190 (1985); *Hedysarum scorpiurus* Swartz, Nov. Gen. & Sp. Prodr.:107 (1788). **Type:** Jamaica, Swartz (S, *fide* Howard, n.v.)

Selected specimens: Western Australia. Port Hedland, *Rumich* s.n. (PERTH). Northern Territory. Darwin, Oct 1971, *Pickering* s.n. (DNA, K). Queensland. Cook DISTRICT: Thursday Is., Oct 1981, *Clarkson* 3817 (BRI, DNA, CANB, K); S of Port Douglas, 16°30'S 145°27'E, Feb 1974, *Gibbs* s.n. (CANB). Hyde Park, Townsville, Feb 1990, *Jobson* 1084, (AD, BRI, CANB, HO, MEL).

Distribution and habitat: The species is native to tropical America, the West Indies and Mexico southward to Peru. It was introduced into Australia as a potential fodder plant and is now naturalised in a few places in the tropical part of the country. It favours open situations on well drained soils, particularly behind coastal dunes. Map 15.

4. ***Desmodium brachypodum*** A. Gray in U.S. Expl. Exped. 434 (1854); Benth., Fl. Austr. 2:232 (1864); Ohashi, Ginkgoana 1:227 (1973); Verdcourt, Man. New Guinea Leg.:394 (1979). **Type:** Hunter River, U.S. Explor. Exped. (n.v.)

D. indigotinum Harms. & K. Schum. in K. Schum. & Laut. Nachr. Fl. Deutsch. Schutz geb. Südsee Nachtr.: 276 (1905). **Type:** Kaiser Wilhelmsland: Finschhafen *Wieland* s.n. (n.v.)

Selected specimens: Northern Territory. Nimbuwa Rock, 12°11'S 133°21'E, Jun 1974. *Pullen* 9502 (CANB). Queensland. LEICHHARDT DISTRICT: West of Moura, 24°34'S 149°39'E, Apr 1961, *Jones* (CANB); BURNETT DISTRICT: Monto, 24°52'S 151°07'E, Jun 1937, *Regan* (BRI); DARLING DOWNS DISTRICT: Canal Creek, in 1880, *Hartmann* 712 (MEL). New South Wales. 3 miles [5 km] from Tent Hill on Torrington road, Nov 1973, *Rodd* 2540 (NSW); Albion Park, Apr 1968, *McBarron* 4617 (NSW); Mt Kaputar National Park, 31 km ENE of Narrabri, Nov 1967, *Coveny* 8916 & Roy (K, NSW). Victoria. East Gippsland, Little River track, Mar 1971, *Beaglehole* ACB 37153 (MEL).

Distribution and habitat: The species is widely spread in eastern Australia from Gippsland, Victoria through coastal and subcoastal parts of New South Wales and Queensland to Cape York Peninsula, often in hilly country on sandy or loamy soils in eucalypt communities. It extends to the Northern Territory (two specimens seen) and eastern New Guinea. *Desmodium brachypodum*, *D. rhytidophyllum* and *D. varians* are the most frequently encountered species of *Desmodium* in eastern Australia. Map 16.

Affinities: Schindler (1926) described *Desmodium* subg. *Oxytes* to accommodate *D. brachypodum* and two New Caledonian species, *D. deplanchei* Harms and *D. pycnostachyum* Benth. Ohashi (1973) reduced this to sectional rank in subg. *Sagotia* with *D. brachypodum* as lectotype.

5. ***Desmodium campylocaulon*** F. Muell. ex Benth., Fl. Austr. 2:233 (1864); *Meibomia campylocaulon* (F. Muell. ex Benth.) Kuntze, Rev. Gen. 1:197 (1891) ('campylocaulis'); *Alysicarpus campylocaulos* (F. Muell.) Schindl., Rep. sp. nov. reg. veg. 21:14 (1925). **Type:** Sturts Creek, March 1856, *F. Mueller* (holo:K).

Prostrate or somewhat ascending perennial herb; branches with indumentum of short erect uncinuate hairs when young, becoming sparse or absent when old; stipules rather stout, triangular, striate, 3–8 mm long, 1.5–3 mm wide at base. Leaves 3-foliolate; petioles (20–)30–70 mm long, rachis 3–11 mm long; leaflets lanceolate to (rarely) ovate, acute or obtuse and mucronulate at the apex, attenuate at the base, glabrous above with sparse hairs usually on veins beneath; terminal leaflet 40–70(–110) mm long, 6.5–15 mm wide, 3–7(–10.5) times longer than wide, the laterals shorter, 30–60(–100) mm long. Inflorescences terminal or rarely leaf-opposed, to 20 cm long, rachis with indumentum of spreading uncinuate hairs c. 0.2 mm long, dense, becoming sparse as inflorescence elongates; flowers in pairs subtended by persistent oval-acuminate glabrous bract, 3–4 mm long; secondary bract and bracteoles absent; pedicels 2–4(rarely 5) mm long at anthesis, doubling in length in fruit. Flowers: calyx 4-merous, 2.5–3.5 mm long, with scattered straight hairs; tube 1–1.5 mm long, lobes 1.5–2 mm long, the upper bifid; corolla pink to pale purple; standard obovate, 3.5 mm long, 2–3 mm wide; wings 3.8–4 mm long, 1 mm wide; keel petals 4.3–4.8 mm long, 1–1.5 mm wide; stamens diadelphous; ovary pubescent. Pod straight, with upper suture thickened, the lower deeply indented; with 5–7 articles, each inflated, indehiscent, (2.5–)3–4 mm long, 2.2–3.3 mm wide, reticulately veined, with spreading uncinuate hairs. Seeds oblongoid, 2.2–2.8 mm long, 1.5–2 mm wide, c. 1 mm thick, the hilum ecentrically placed on the long side, rim aril small.

Selected specimens: Western Australia. 40 km SE of Fitzroy Crossing, 18°28'S 125°45'E, May 1988, *Pullen* 11197 (CANB). Northern Territory. 30 miles [48 km] E of 'Alexandria' Station, Jun 1948, *Perry* 1507 (BRI, CANB, K); 25½ [41 km] W of 'Rockhampton Downs', Jun 1960, *Chippendale* NT 7118 (DNA, K, MEL). Queensland. SOUTH KENNEDY DISTRICT: 2 miles [3 km] NE of 'Natal Downs' Station, 21°04'S 146°08'E, Jul 1964, *Adams* 1147 (BRI, CANB, K); WARREGO DISTRICT: Gilruth Plains, Cunnamulla, 28°04'S 145°41' E, Apr 1963, *McKee* 10311 (BRI, CANB, K).

Distribution and habitat: *Desmodium campylocaulon* extends from the northern part of Western Australia through the north-central part of the Northern Territory into inland southern Queensland. It is confined to clay

soils, usually in grassland with *Astrebla* spp. and *Iseilema* spp. Map 17.

Affinities: As sole member of sect. *Desmodiopsis* (see above, p.226) *D. campylocaulon* has no close relative, though in habit, general appearance and ecology it resembles *D. muelleri* (sect. *Sagotia*). In his description of *D. campylocaulon*, Benth described the pod-articles as 'membranous turgid or almost inflated when ripe'. Such a description is misleading. The pods are, in fact, markedly inflated and unlike the pods of any other Desmodieae. Presumably because of these inflated articles, Schindler transferred the species to *Alysicarpus*, describing a new section *Desmodiopsis* to accommodate it. *Alysicarpus* has turgid pods which are symmetrical: that is, their upper and lower margins are equally indented. They are also less membranous. The calyx of *Alysicarpus* is scarious with complex venation, unlike that of *D. campylocaulon*. As generally understood *Alysicarpus* is an easily recognised, nicely circumscribed, homogeneous genus. The addition of *D. campylocaulon* to it, even in a distinct section, obscures the present clear generic limits without doing anything to clarify the already rather indistinct limits of *Desmodium*. Prain (1897), commenting on Baker's (1876) transfer of *Alysicarpus parviflorus* Dalzell and other species to *Desmodium*, and concerned that it would not fit well in that genus, stated: 'Compromises in taxonomy are necessary, indeed the systematic arrangement of the species is essentially the art of happy compromise, but an arrangement which places one half of a natural group of forms in one genus, the other half in a second, strains unduly the privileges that the art of compromise allows'. Prain's principle still applies. *Alysicarpus parviflorus* and related trifoliolate species are now referred to *Desmodiastrum* A. Pramanik & Thoth. (Pramanik & Thothathri 1986). Rather than to complicate *Alysicarpus* which, despite comments to the contrary by Prain (*op. cit.*) and Meeuwen (1962), is quite distinct from *Desmodium*, I have treated *D. campylocaulon* as the only member of a section of *Desmodium*. No other genus of Desmodieae has inflated pod articles. The pods of *Pycnospora*, which is

conventionally, though possibly wrongly, placed in the tribe are inflated but are 7–10 seeded, not segmented, and are not analogous to those of *D. campylocaulon*.

- 6. *Desmodium microphyllum*** (Thunb. ex Murray) DC., Prodr. 2:337 (1825); van Meeuwen, Reinwardtia 6:254 (1962); Ohashi, Ginkgoana 1:241 (1973) & Fl. Camb. Laos Vietn. 27:105 (1994); Verdcourt, Man. New Guinea Leg. 402 (1979); Pedley, Rev. Handb. Fl. Ceylon 10:176 (1996); *Meibomia microphylla* (Thunb.) Kunze, Rev. Gen. 1:198 (1891); *Hedysarum microphyllum* Thunb. ex Murray, Syst. Veg. ed. 14:675 (1785), Fl. Jap. 284 (1784); Poir. in Lam, Encycl. Method. Bot. 6:417 (1804). **Type:** from Japan (n.v.)

Desmodium parvifolium DC., Ann. Sci. Nat. 4:100 (1825) & Prodr. 2:234 (1825); Wright & Arn., Prodr. Fl. Ind. Orient. 229 (1834); Benth., Fl. Austral. 2: (1864). **Type:** Nepal, in 1821, Wallich 5700 (iso:K).

Selected specimens: Queensland. NORTH KENNEDY DISTRICT: Rockingham Bay, Dallachy (MEL, NSW); PORT CURTIS DISTRICT: Port Clinton, 22°38'S 150°42'E, Clarkson & Stanley 855 (BRI, CANB); MORETON DISTRICT: Mor(e)ton Bay, Mueller (K, MEL). New South Wales. Richmond River, Moore (K).

Distribution and habitat: *Desmodium microphyllum* is not a common plant in Australia. It has been collected in coastal areas from about Cairns south to the Richmond River, but little is known about its ecological requirements. It does occur in eucalypt open-forests and is evidently native. The species has a huge latitudinal range, extending through Malesia to south-eastern Asia and China and Japan. Specimens collected near the type locality, Nagasaki (Maximowicz in 1863, Oldham in 1862, K) leave no doubt that the Australian and the east Asian plants represent the same species. Map 18.

Affinities: Benthams (1852) placed *D. microphyllum* (as *D. parvifolium*) in sect. *Sagotia* with *D. triflorum* and *D. heterophyllum*, and it does have affinities with these species. However, its pod incised along the upper suture (not notched between articles) and, more importantly, the well developed aril set it apart

from *D. triflorum*, *D. heterophyllum* and the other species I have referred to sect. *Sagotia*. I have therefore treated it as the single species of ser. *Arillata*. The well developed aril suggests a relationship with *Codariocalyx*, but other attributes do not support such a relationship.

- 7. *Desmodium triflorum*** (L.) DC., Prodr. 2:334 (1825); Liu & Chang, Taiwania 8:96 t.22 (1962); Schubert, J. Arnold Arb. 44: 293 (1963) & Fl. Trop. East Africa: Legum. Papilion. 459 (1971); Ohashi, Ginkgoana 1:245 (1973) & Fl. Camb. Laos Vietn. 27:11 (1994); Verdcourt, Kirkia 9:512 (1974) & Man. New Guinea Leg. 409 (1979); Du Puy, Fl. Austral. 50:314 (1993); Pedley, Rev. Handb. Fl. Ceylon 10:178 (1996); *Sagotia triflora* (L.) Duchass. & Walpers, Linnaea 23:738 (1850); *Meibomia triflora* (L.) Kuntze, Rev. Gen. 1:197 (1891) (incl. vars.); *Hedysarum triflorum* L., Sp. Pl. 749 (1753). **Type:** Herb. Hermann vol. 1 fol.21, No.297 (BM, lectotype *fide* Pedley in Turland & Jarvis (1997)).

Selected specimens: Northern Territory. Palmerston, 12°29'S 130°59'E, May 1992, Cowie 3017 (BRI, DNA). Queensland. COOK DISTRICT: Mareeba, Apr 1983, Clarkson 4587 (BRI, K); NORTH KENNEDY DISTRICT: Tully & vicinity, Jan 1950, Clemens (ex herb. Univ. Michigan) (BRI, K); WIDE BAY DISTRICT: Bundaberg, Apr 1936, Blake 11253 (BRI, CANB, K, MEXU); MORETON DISTRICT: Bribie Is., May 1930, Hubbard 2667 (BRI, K).

Distribution and habitat: This species is distributed through the tropics and subtropics. It occurs in open spaces, on roadsides and is often a weed of lawns, usually on well drained soils. In Australia it occurs in the extreme north of the Northern Territory and along the east coast north from about Brisbane. It is so well established in south-eastern Queensland that it is hardly conceivable that it does not extend into New South Wales, but I have seen no specimens. Map 19.

Affinities: *Desmodium triflorum* and *D. heterophyllum* are closely related. The latter has larger, more elongate leaflets and the upper calyx lobes are united to the middle. The two species constitute ser. *Sagotia* of sect. *Sagotia* and therefore stand somewhat apart from other species of the section.

8. *Desmodium heterophyllum* (Willd.) DC., Prodr. 2:334 (1825); White & Francis, Qld Dept. Ag. & Stock Bot. Bull. 22:14 (1920); Liu & Chang, Taiwania 8:81 t.10 (1962); Ohashi, Ginkgoana 1:239 (1973) & Fl. Camb. Laos Vietn. 27:110 (1994); Verdcourt, Man. New Guinea, Leg. 400 (1979); Pedley, Rev. Handb. Fl. Ceylon 10:179 (1996); *Meibomia heterophylla* (Willd.) 10:179 Kuntze, Rev. Gen. 1:196 (1891); *Hedysarum heterophyllum* Willd., Sp. Pl. 3:1201 (1802); **Type:** Herb. Willdenow 13832 (B, n.v.; microfiche: BRI)

Hedysarum triflorum var. β & γ L., Sp. Pl. 749 (1753).

Selected specimens: Queensland. COOK DISTRICT: Bolt Head, Temple Bay, 12°15'S 143°05'E, Jul 1991, *Forster* PIF 8988 (BRI); Cairns, Feb 1918, *White* [AQ 19947] (BRI); South Johnstone, Apr 1952, Bureau of Tropical Agriculture [AQ 97399], possibly cultivated (BRI); SOUTH KENNEDY DISTRICT: Slade Point, 21°05'S 149°13'E, Aug 1992, *Batianoff* 920853 & *Champion* (BRI).

Distribution and habitat: *Desmodium heterophyllum* is a comparatively recent introduction to Australia and is only sparingly naturalised and poorly collected. Little is known of its ecology though it is found on sand behind dunes on beaches immediately north of Cairns. Map 20.

Affinities: The species is closely related to *D. triflorum* though not likely to be confused with it. Ohashi (1973) described the upper two lobes of the calyx to be 'deeply incised near base'; they are in fact united to about the middle as can be seen in his illustration (t. 53:3).

9. *Desmodium pycnotrichum* Pedley, sp. nov. leguminibus sutura supra inter articulos acute incisa praeditis similis eis *D. filiformis* Zoll. et Moritzi et *D. trichostachyi* Benth. autem ab ambabus ovario et plerumque aliquis leguminis trichomatibus clavatis ornatis differt. Id foliolum terminale longum *D. filiformis* caret. **Typus:** Northern Territory: Coastal Plains Research Station [12°34'S 131°19'E], Mar 1963, *M. Lazarides* 6828 (holo: CANB; iso: BRI, K, MEL).

Annual herb often flowering and fruiting when \pm erect, but becoming prostrate; branches with

moderate to dense, stiff, yellowish, spreading hairs 0.8–1.2 mm long. Leaves 3-foliolate, occasionally 1-foliolate; stipules 3–7 mm long, hairy at the base or with marginal hairs; petioles 3.5–21(–24) mm long; rachis 2.5–6.5(–10) mm long; leaflets cuneiform, obovate or sometimes oblong, attenuate at the base, retuse or truncate at the apex, usually glabrous, or occasionally with sparse appressed hairs on the upper surface, sparse appressed or occasionally loosely ascending hairs 0.6 mm long on lower surface; terminal leaflet 8.5–30 mm long, (8–) 10–20(–22) mm wide, 0.8–1.5 times longer than wide, laterals smaller, 7–19(–24) mm long, 5–14(–17) mm wide, 0.9–1.6 times longer than wide; pulvinuses 0.8–1.6 mm long; stipels 1.5–2 mm long. Inflorescences terminal, open, to 25 cm long, rachis with sparse to rather dense spreading hairs, rarely appressed, to 1 mm long; flowers single on the rachis; primary bract acuminate, 2.5–5 mm long, pubescent; secondary bract and bracteoles absent; pedicels slender, 5–9 mm long. Flowers: calyx 2–3 mm long with linear lobes, the upper bifid to the middle, the tube $\frac{1}{4}$ – $\frac{1}{3}$ total length, long hairs on lobes and short sparse uncinat hairs on tube; corolla pink, occasionally red or rarely bluish with standard obovate, 3–3.5 mm long, 1.5–2.5 mm wide, wings c. 2.5 mm long, 0.7–1 mm wide, on short claw, keel petals slightly longer, tapered to the base, not clawed; stamens diadelphous; ovary with dense covering of clavate hairs. Pods \pm straight, the upper suture notched between the lobes, the lower deeply indented between them, the isthmus about half width of pod, with 3 or 4 articles, each 2–3.5(–4) mm long, 2–3(–4) mm wide, with indumentum of clavate hairs, rarely some glabrous, nervature similar to that of *D. trichostachyum*; seeds reniform, black when mature, 1.7–3(–3.6) mm long, (1.2–)1.4–2 mm wide with small rim aril.

Selected specimens: Western Australia. Manning Creek Gorge, near 'Mt Barnett' Station, 16°39'S 125°55'E, May 1988, *Pullen* 11211 (BRI, CANB, DNA, PERTH). Northern Territory. Tortilla Flats, 13°06'S 131°14'E, Apr 1974, *Parker* 411 (DNA, CANB); Woolanang, 13°07'S 130°40'E, Apr 1981, *Dunlop* 5879 & *Craven* (BRI, CANB, DNA, MEL); 12 km S of Hayes Creek, 13°35'S 131°30'E, Apr 1988, *Pullen* & *Spottswood* 11165 (BRI, CANB, DNA); Douglas Hot Springs National Park, 13°45'S 13°126'E, Apr 1988, *Pullen* & *Spottswood* 11159 (BRI, CANB, DNA, K, L, PERTH);

Smith Creek, Coburg Penin., 11°07'S 132°08'E, Apr 1977, Pullen 10619 (CANB, DNA).

Distribution and habitat: The species usually occurs on sandy soils, sometimes in disturbed situation, sometimes associated with *D. pullenii* (Pullen & Spottswood 11158 is a mixed collection). It is confined to the Dieman and Gulf Region of the Northern Territory and the Kimberley Region of Western Australia. Pullen (in sched., Pullen 11211) suggests that it may be a recent introduction to Western Australia, but it was collected by Bradshaw and Allen on the Prince Regent River in 1891 (specimens, MEL). Map 21.

Affinities: *Desmodium pycnotrichum* has pods like those of *D. filiforme* and *D. trichostachyum* and is probably closely related to the latter. It differs from both in the unusual clavate trichomes on the ovary which usually persist on the pod. Its foliage resembles that of *D. trichostachyum* and lacks the long terminal leaflet of *D. filiforme*. However, one specimen (Reeve & Watson 228, DNA) with elongated terminal leaflets (3–4.5 times longer than wide) possibly represents a *D. filiforme* × *D. pycnotrichum* hybrid.

Etymology: The epithet is a Latinisation of Greek: *pychno*, thick, and *thrix*, *trichos*, hair, a reference to the peculiar indumentum of ovary and, usually, pods. Specimens have been distributed with the name *D. 'clavitricha'*, a name coined by Mr R. Pullen who recognised the species as distinct. Regrettably the epithet is neither grammatically nor etymologically acceptable and has therefore been replaced.

- 10. *Desmodium trichostachyum* Benth., Fl. Austr. 2:234 (1864); Ohashi, Ginkgoana 1:244 (1973). *Meibomia trichostachya* (Benth.) Kuntze, Rev. Gen. 1:198 (1891). **Type:** Port Essington, Armstrong (lecto: K, chosen here).**

Prostrate or slightly ascending annual herb; stems slender, terete, glabrous or with sparse appressed or occasionally spreading hairs (0.6 mm long). Leaves 1- or 3-foliolate, sometimes on separate plants, sometimes leaves of both types on one plant, in which case the 1-foliolate produced before the 3-foliolate ones; stipules

ovate or deltoid, acute, 2.5–4 mm long, 1–1.5 mm wide; petiole 3–12 mm long, rachis 1–4 mm long; leaflets depressed ovate, orbicular or occasionally broadly oblong, rounded or subcordate at the base, retuse at the apex when 1-foliolate, cuneiform, rounded or subcordate at the base, truncate or retuse at the apex when 3-foliolate, all \pm glabrous or with sparse appressed hairs on lower surface; when 1-foliolate, leaflet 8–20 mm long, 9–20 mm wide, 0.7–1.2 (–1.4) times wider than long; when 3-foliolate terminal leaflet 5–15 mm long, 6–16 mm wide, 1–1.4 times wider than long, lateral leaflets smaller, 4–12 mm long and wide, (0.7)1–1.2 times longer than wide; pulvinuses 0.5–1.5 mm long; stipels 0.2–1 mm long. Inflorescences terminal, very open, to 25 cm long, the rachis with a few appressed or rarely spreading hairs towards the apex, flowers single (rarely in pairs) subtending by an ovate acuminate bract 1–2 mm long, secondary bracts and bracteoles absent; pedicels slender, 2–6 mm long, doubling in length in fruit. Flowers: calyx 1.4–2.1 mm long, uncinately pubescent or occasionally lobes strigose with hairs to 1 mm long; tube 0.5–0.7 mm long, upper lobe 0.8–1.4 mm long, incised to about the middle, other lobes shorter or about equal in length, 0.6–1.3 mm long; corolla purplish: standard obovate, obtuse or retuse at apex, narrowed to base but not distinctly clawed, 2.5–3.3 mm long (1.6–)2–2.5 mm wide, wings broad oblong with short claw, 1.8–2.5 mm long, 0.7–1.2 mm wide, keel petals somewhat longer and narrower than wings, 2.2–2.9 mm long, 0.7–1 mm wide, tapered to base, not distinctly clawed. Pods with upper suture thickened, notched between articles, lower indented, isthmus $\frac{1}{2}$ – $\frac{2}{3}$ width of pod, with 3–5 articles, each 2–2.8 mm long and wide, glabrous or with uncinately hairs, transversely reticulately veined; seed 1.3–1.7 mm long, 0.9–1.5 mm wide, with a rim aril.

Selected specimens: **New Guinea.** MERAUKE: Koerike Camp, c.15 km NE of Koembe village on Koembe river, Sep 1954, *P. van Royen* 4910 (L). **Western Australia.** King Edward River Crossing, May 1975, *Symon* 10250 (NSW); Augustus Is., 15°25'S 124°35'E, May 1972, *Wilson* 10719b & 10877 (PERTH). **Northern Territory.** Humpty Doo, Feb 1961, *McKee* 8356 (CANB, K, L); Arnhem Land, 12°55'S 135°17'E, Jun 1972, *Maconochie* 1498 (DNA, K); Elcho Is., Jul 1975, 11°47'S 135°53'E, *Maconochie* 2223 (DNA). **Queensland.** COOK DISTRICT: Newcastle Bay [10°49'S 142°36'E], May 1948, *Brass*

18740 (BRI, CANB, K, L); 2 km S of Moreton Telegraph Station, 12°28'S 142°38'E, *Kanis* 2037 (CANB, L); Endeavour River, Jun 1819, *Cunningham* 243 (K); Gorge Creek, 10 miles [16 km] W of Mareeba, Apr 1962, *McKee* 9265 (BRI, CANB, K, L).

Distribution and habitat: *Desmodium trichostachyum* occurs on sandy soils, sometimes seasonally waterlogged, in eucalypt and *Melaleuca* communities in coastal areas from the Kimberley region of Western Australia, through the Northern Territory to northern Queensland south to about the Atherton Tableland. It also occurs in southern New Guinea. Map 22.

Affinities: *Desmodium trichostachyum*, *D. pycnotrichum*, *D. filiforme* and *D. brownii* constitute a complex of species of ser. *Stenostachys* characterised among other attributes by small pods with the upper suture distinctly notched between the articles. This attribute distinguishes them from another complex of species, *D. glareosum*, *D. hannii*, *D. muelleri* and *D. pullenii*, where the upper suture is continuous, not notched between the articles.

The dimorphic foliage of *D. trichostachyum* distinguishes it from all other species. Living plants have not been studied but a sequence of development of leaves can be deduced from the large number of herbarium specimens examined. The plants which are annual or short-lived perennials first develop leaves with a single depressed ovate leaflet. If environmental conditions favour rapid growth plants may flower and fruit at this stage, or, if not, may develop leaves with three cuneiform leaflets before flowering. Consequently plants with unifoliate leaves only, trifoliate leaves only, or commonly a mixture of both are represented in herbarium collections. The lectotype specimen has both uni- and trifoliate leaves.

11. *Desmodium filiforme* Zollinger & Moritzi, *Natuur-en Geneeskunding Archief voor Nedeêland's Indie* 3:58, 77 (1846); Ohashi, *Ginkgoana* 1:237 (1973); *Meibomia filiformis* (Zoll. & Moritzi) Kuntze 1:198 (1891). **Type:** 'Zoll. & Mor. Herb. 2738'. Java in arenosis maritimis prope Poeger (iso:BM)

Desmodium neurocarpum Benth., *Fl. Austr.* 2:234 (1864); *Meibomia neurocarpa*

Austrobaileya 5(2): 209–261 (1999)

(Benth.) Kuntze, *Rev. Gen.* 1:198 (1891). **Type:** Upper Victoria River, *Mueller* (holo: K).

Desmodium neurocarpum var. *queenslandicum* Domin, *Biblioth. Bot.* 89:214 (1926). **Type:** In fl. Flinders River ad opp. Hughenden, Feb 1910, *Domin* '4733' (lecto: PR 527380, chosen here).

Sprawling annual, stems terete with indumentum of long (to 1 mm) spreading hairs, occasionally subglabrous. Leaves 3-foliate or, usually on young plants, 1-foliate or both 1- and 3-foliate; stipules triangular, 2–5 mm long; petioles 4–18 mm long; rachis 1.5–6 mm long; leaflets chartaceous, linear-oblong, oblong or obovate-oblong, rounded or subcordate at the base, emarginate at the apex, usually with scattered appressed hairs on the upper surface, sparse appressed hairs on the lower surface, sometimes glabrous; terminal leaflet 10–35(–45) mm long, 3.5–12.5(–14) mm wide, 1–5(–8) times longer than wide, lateral leaflets smaller, (5–)10–22(–26) mm long, 3–7(–10) mm wide, 1.4–4.5(–6.5) times longer than wide. Inflorescences terminal, open, to 20 cm long, rachis with long hairs, usually spreading, sometimes appressed, to 1 mm long; flowers single along rachis, primary bract 2–3 mm long, deciduous, secondary bracts and bracteoles absent; pedicels 3–4 mm long. Flowers: calyx 2.3–2.5 mm long, indumentum of minute uncinata hairs and long (0.6–1 mm) straight hairs on lobes; tube 0.7 mm long, all lobes about equal length, tending sometimes to incurve, the upper divided to $\frac{1}{2}$ – $\frac{2}{3}$ length, the lower sometimes narrower than the others; corolla white to pink or mauve; standard obovate, obtuse at apex, 2.5–2.7 mm long, 1.6–2.2 mm wide, wings and keel petals about equal in length, 2–2.6 mm long; stamens diadelphous; ovary usually with rather sparse uncinata hairs or occasionally glabrous. Pods straight, the upper suture sharply notched between articles, the lower undulate, isthmus about $\frac{1}{2}$ width of pod, with 3, 4 or rarely 5 articles, each (2.5)3–5 mm long, 2.5–4(–4.5) mm wide, one exceptional specimen with only one article per pod developed, 5.5–6.2 mm long, 4 mm wide, glabrous or sparsely uncinata pubescent, reticulated veined (often purplish), raised in centre over seed, usually the anastomoses small,

± equilateral in central area and larger, radially rectangular to the periphery; seeds 2–3 mm long, 1.5–2 mm wide.

Selected specimens: Java, Berachi, Poegar, Apr 1929, Backer 3650 (L). New Guinea, Merauke, Aug 1904, Kock (L); Koitaki, Jun 1935, Carr 12673 (CANB, K, L). Western Australia, 16 km S of Port Hedland, 20°23'S 118°40'E, Apr 1977, George 14565 (K, PERTH); 19.6 km S of Derby, 17°27'S 123°44'E, Apr 1985, Aplin *et al.* 58 (PERTH); 5 miles [8 km] W of Kununurra, East Kimberleys, 14°46'S 128°41'E, Mar 1963, Lazarides 6733 (CANB); NW of Deception Range, 15°53'S 128°36'E, Mar 1978, Hartley 14784 (CANB, PERTH); Piccaninny Creek Gorge, 17°27'S 128°25'E, Blackwell BB 187, 180b & 377 (PERTH). Northern Territory, Daly River, 13°52'S 131°11'E, Apr 1988, Pullen & Spottswood 11162 (CANB); McArthur River area, 16°07'S 136°07'E, Jun 1976, Craven 4088 (CANB); South Bickerton Is., 13°45'S 136°06'E, Jun 1948, Specht 505 (BRI, CANB, K, MEL); Maude Creek, 12 miles [19 km] NE of Katherine, 14°23'S 132°24'E, Mar 1965, Wilson 370 (CANB, K). Queensland, BURKE DISTRICT: E of 'Westmoreland' Station, 17°30'S 138°20'E, May 1974, Pullen 9131 (CANB, K); COOK DISTRICT: Cooktown, mouth of Endeavour River, 15°28'S 145°15'E, May 1970, Blake 23296 (BRI, K, MEL); Mareeba, Apr 1967, Pedley 2270 (BRI, K); NORTH KENNEDY DISTRICT: 70 km S of Charters Towers, 20°40'S 146°17'E, May 1988, Pullen 11255 (CANB); PORT CURTIS DISTRICT: Rockhampton, Apr 1867, O'Shanesy 116 (MEL).

Distribution and habitat: *Desmodium filiforme*, the most widespread species of ser. *Stenostachys* in tropical Australia, occurs over most of the northern half of Queensland and extends across the Northern Territory to the northern part of the Kimberley region of Western Australia with isolated occurrences near Port Hedland (George 14565) and Lake Surprise, Lander River (Maconochie 1695). It is also found in southern New Guinea and Java. The species is confined to sandy soils, sometimes seasonally waterlogged, in eucalypt communities, dry beds of streams, flood-outs and coastal dunes; in coastal areas it is sometimes associated with *D. trichostachyum*. Map 23.

Affinities: Because of its long terminal leaflet *D. filiforme* most closely resembles *D. pullenii* but differs from it in having the upper suture of the pod notched between articles and the central portion of each article raised over the seed with the veins closely anastomosing and radiating to the margins. It and *D. brownii* which has

narrower leaflets are probably more closely allied to *D. trichostachyum* and *D. pycnotrichum* which have similar pods.

Knaap-van Meeuwen (1962) included *D. muelleri*, and judging from her remarks, possibly also *D. pullenii* in *D. filiforme*. Ohashi (1973) pointed out that such a treatment was unacceptable; he also suggested that *D. filiforme* can be separated from *D. trichostachyum* only with considerable difficulty except for the shape of the leaflets and pods. The shape of the leaflets and the indumentum of the branchlets and leaves, but not the shape of the pods, are sufficient to differentiate the two species. Ohashi may also have had material of more than one species.

- 12. *Desmodium brownii* Schindl., Notes Roy. Bot. Gard. Edinburgh 25:13 (1926) & Rep. sp. nov. reg. veg. 22:256 (1926). Type:** (syntypes): North Coast, Brown s.n. (E?, not seen); Brown '4188' (iso: BM, K).

Desmodium neurocarpum var. *gracile* Benth., Fl. Austr. 2:234 (1864). Type: North Coast, Brown (holo:K).

Erect annual to 75 cm tall; stems ± terete with indumentum of weak erect uncinat hairs, often with stiff ascending or spreading hairs 0.6–1 mm long. Leaves 3-foliolate or 1-foliolate towards the base of the plant; stipules rather attenuate, 2–6.5 mm long; usually with long hairs on the margin; petioles 2–9(–15) mm long; rachis (1–)2–4(–5) mm long; leaflets linear or oblong-linear, rounded at the base, obtuse at the apex, glabrous or with sparse appressed, rarely ascending hairs on upper surface, sparse appressed hairs on lower; terminal leaflet 10–50(–65) mm long, 1.8–4(–5.5) mm wide, 3.5–13 times longer than wide, laterals smaller 5.5–36 mm long, 1.5–4.5 mm wide 3–12(–14) times longer than wide. Inflorescence terminal and in the upper axils, to 20 cm long, open; rachis with indumentum of uncinat hairs, occasionally with long hairs near the base; flowers single or rarely in pairs; primary bracts 1.5–3 mm long, acuminate, pubescent on margin in upper half, deciduous; secondary bracts and bracteoles absent; pedicels filiform,

5–15 mm long. Flowers: calyx tube c. 0.5 mm long, the lobes all 0.6–0.7 mm long, the upper divided to about the middle, the lower acuminate; corolla pink or mauve with standard obovate c. 3 mm long, 3 mm wide; wings oblong, c. 2 mm long; keel petals about as long as the wings. Pod flat, the upper suture notched at the junction of the articles, the lower more gently incised, the isthmus $\frac{1}{4}$ – $\frac{1}{2}$ width of pod, with 3 or 4 articles, each oblong or orbicular 2.5–3.5 mm long, 2.2–3 mm wide, uncinat hairs on faces and fringe of uncinat hairs on margins, sometimes becoming glabrous, reticulately nerved, raised in centre over the seed, usually the anastomoses small, \pm equilateral in central area, larger and radially rectangular to the periphery; seeds 1.7–2.5 mm long, 1.3–1.7 mm wide, with a small rim aril.

Selected specimens: **Western Australia.** King Leopold Range, 17°02'S 125°14'E, May 1988, *Pullen* 11206 (CANB); Carr Boyd Range, 20 km ENE of 'Dunham River' H.S., 16°15'S 128°30'E, Mar 1978, *Lazarides* 2814 (CANB, K, PERTH); Weaber Range, 15°20'S 128°48'E, Mar 1978, *Hartley* 14472 (CANB, PERTH). **Northern Territory.** Woolanang, 13°07'S 130°40'E., Apr 1981, *Dunlop* 5880 (CANB, DNA, MEL NSW); 8 miles [13 km] NNE of Edith River siding, Mar 1965, *Lazarides* & *Adams* 117 (BRI, CANB, K, MEL); 16 miles [26 km] SE of El Sharana mine, 13°41'S 132°41'E, Feb 1973, *Lazarides* 7873 (AD, CANB, K, PERTH); Victoria River, Gregory National Park, 15°28'S 131°15'E, *Wightman* 2767 & *Clark* (DNA). **Queensland.** COOK DISTRICT: 19 km S of Palmer River crossing 16°15'S 144°43'E, Mar 1987, *Clarkson* 6639 & *McDonald* (BRI, K, MBA).

Distribution and habitat: *Desmodium brownii* is confined to the southern part of Cape York Peninsula, Queensland, the northern part of the Northern Territory and the Kimberley region of Western Australia, on sandy soil, often shallow or gravelly on hillsides. Map 24.

Affinities: The species is closely related to *D. filiforme* to which Bentham referred it as a variety (of *D. neurocarpum*), but differs in its erect habit, narrower leaflets, rachis of the inflorescence lacking spreading hairs except at the base, and longer pedicels.

13. Desmodium flagellare Benth., Fl. Austr. 2:233 (1864); Schindl., Rep. sp. nov. reg. veg. 22:255 (1926); *Meibomia flagellaris* (Benth.) Kuntze 1:198 (1891). **Type:** Beagle Valley [approx. 15°35'S 130°55'E], in 1855, *Mueller* (holo:K).

Prostrate annual spreading to a metre or more; branches terete with sparse to moderately dense ascending to \pm spreading hairs to 0.5 mm long with shorter dense uncinat hairs. Leaves 3-foliate or 1-foliate towards base of plant; stipules 3–6 mm long, somewhat acuminate, with a few long hairs; petiole 5–12 mm long; rachis 1.5–4 mm long; leaflets cuneiform, obovate or oblong, rounded or slightly cordate at the base, slightly retuse at the apex, glabrous on upper surface, sparse appressed pubescent on lower surface or hairs confined to midrib and margins, hairs rather loose; terminal leaflet 15–25 mm long, 14–20 mm wide, the lateral ones smaller, 10–20 mm long, c. 12 mm wide, all (1–)1.2–1.4 times longer than wide; pulvinules and stipels 1–1.5 mm long. Inflorescences terminal and in upper axils, to 20 cm long, rachis with sparse appressed hairs, fruiting pedicels c. 20 mm apart on rachis, rather closer than in related species; flowers single on the rachis; primary bract concave, ovate, 2–5 mm long, rather persistent, secondary bracts and bracteoles absent; pedicels 3–7 mm long. Flower: calyx 3–4 mm long, the tube c. 1 mm long, upper lobe divided to about the middle, lobes with long white spreading hairs; corolla not examined; stamens diadelphous; ovary densely uncinat pubescent. Pods with upper suture continuous, not notched between articles, the lower indented, isthmus c. $\frac{4}{5}$ width of pod, with 1–3, rarely 4 articles, each 3.5–4.5 mm long, 3–3.5 mm wide, uniformly sparsely to densely pubescent on faces and margins with uncinat hairs; seeds not seen.

Specimens examined: **Western Australia.** Kimberley Research Station [15°39'S 129°43'E], Mar 1963, *Lazarides* 6784 (CANB, K, PERTH). **Northern Territory.** Victoria River, Gregory National Park, 15°35'S 131°21'E, Feb 1986, *Wightman* 2777 & *Clark* (DNA).

Distribution and habitat: *Desmodium flagellare* is restricted to heavy soils and has an extremely limited geographic range in the lower part of the Ord and Victoria River basins. Map 25.

Affinities: The type material of *D. flagellare* is so poor as to make interpretation of the name of the species difficult; not only is the type specimen fragmentary but, as Schindler pointed

out, it is intertwined with another legume (Cajanineae, probably *Rhynchosia* sp.). The pods with the continuous upper suture and with rather large articles, suggest a relationship with *D. hannii* and *D. muelleri*, species also common on heavy soils. Further specimens are needed for the species to be described in detail and its relationships clarified.

14. *Desmodium hannii* Schindl., Rep. sp. nov.
reg. veg. 21:4 (1925). **Type:** Carpentaria, F.C. Hann (B†). Queensland. COOK DISTRICT: 4.8 km N of Little Laura River on Peninsula Development Road, (15°30'S 144°17'W), 27 April 1983, J.R. Clarkson 4780 (neo: BRI; isoneo: CANB, K, MBA, QRS; chosen here).

Decumbent or prostrate annual herb, stems up to 1 m long; branches with sparse spreading or ± appressed white hairs and sometimes shorter uncinuate hairs. Leaves 1- or 3-foliate (usually on same plant); stipules 2.5–4.5 mm long, 1–1.8 mm wide at base; petioles (1.5–)4–9(–16) mm long, rachis 1–3.5 mm long; leaflets chartaceous, cuneiform or broadly obovate when trifoliate, or obicular when 1-foliate, rounded or slightly emarginate at the base, rounded at the apex, glabrous or with scattered appressed hairs above, with sparse to moderate appressed or somewhat ascending hairs especially on midrib beneath, 3 or 4 prominent lateral veins on each side of midrib; terminal leaflet 6–25(–30) mm long, 6–20 mm wide, 0.9–1.5(–1.8) times longer than wide; lateral leaflets smaller, 6–15 mm long, 6–12 mm wide, 0.9–1.3 times longer than wide. Inflorescences terminal and/or axillary, open, to 12 cm long; rachis with appressed hairs c. 1 mm long; flowers solitary; primary bracts ovate, 3.2–3.5 mm long, early deciduous; secondary bracts and bracteoles absent; pedicels 3–4.5 mm long. Flowers: calyx 2.7–3.2 mm long, long hairs on margins and midlines of lobes; tube 0.7–0.9 mm long, upper lobe 2–2.5 mm long, narrowly triangular, wider than the others, divided to about the middle; lateral lobes 1.8–2.5 mm long, lower lobes c. 2 mm long, slightly wider than laterals; corolla pink or mauve; standard obovate, obtuse at the apex, 3–4 mm long, 1.6–3 mm wide; wings 2.3–2.8 mm long, shortly clawed, c. 1 mm wide; keel petals longer and

narrower than wings, 2.6–3.5 mm long, 0.5–1 mm wide; stamens diadelphous; ovary pubescent. Pod lightly but distinctly recurved, the upper margin continuous, not notched between articles, the lower incised, the isthmus $\frac{1}{3}$ – $\frac{1}{2}$ or more width of pod, with 2–4, rarely 5 articles, each (2.5–)2.8–4.2(–5) mm long, 2.5–3.5 mm wide, pubescent with uncinuate hairs, particularly on margins; seeds c. 2.5 mm long, 1.6 mm wide.

Selected specimens: **Western Australia.** King Leopold Ranges, 17°07'S 125°20'E, May 1988, Pullen 11205 (CANB). **Northern Territory.** 3 km S of Katherine, 14°29'S 133°46'E, May 1988, Pullen & Spottswood 11176 (CANB); Beswick Aboriginal Reserve, 14°33'S 133°00'E, May 1974, Pullen 9329 (BRI, CANB, K); 38 miles [61 km] ESE of 'Limbunya' Station, Jun 1949, Perry 2294 (CANB, PERTH). **Queensland.** COOK DISTRICT: 4.8 km N of Little Laura River, 15°30'S 144°17'E, Apr 1983, Clarkson 4780 (BRI, CANB, K, MBA, QRS).

Distribution and habitat: *Desmodium hannii* has a discontinuous distribution in tropical Australia. It appears to be most common and has been most frequently collected in the north-central part of the Northern Territory with two collections from the Kimberley region of Western Australia. It also occurs in north-eastern Queensland. It favours heavy soils and sometimes occurs with *D. muelleri* (collector's note: Pullen 9329) and its absence from grassland dominated by *Astrebla* spp. and *Dichanthium* spp. in north-western Queensland is unexpected. It is reported to be favoured by stock. Map 26.

Affinities: The species is a member of ser. *Stenostachys* closest to *D. muelleri* from which it differs in its curved pods, leaves often unifoliate with less elongate leaflets. It may be a neotonic derivative of *D. muelleri* bearing the same relationship to it as *D. trichostachyum* does to *D. pycnotrichum*.

15. *Desmodium muelleri* Benth., Fl. Austr. 2:235 (1864); van Meeuwen, Reinwardtia 6:249 (1962), pro syn. *Meibomia muelleri* (Benth.) Kuntze, Rev. Gen. 1:198 (1992). **Type:** Upper Victoria River, Mueller (holo:K).

Decumbent or prostrate annual; stems with indumentum of sparse stiff, usually appressed,

occasionally ascending, rarely spreading, white hairs to c. 1 mm long. Leaves 1- or 3-foliolate, both on same or occasionally on different plants; stipule 3–6 mm long glabrous or with marginal hairs; petiole 3–12 mm long, rachis 1.5–5 mm long; leaflets chartaceous, narrowly ovate, elliptic or oblong, occasionally broadly oblong when 1-foliolate, rounded at the base, obtuse or retuse at the apex, glabrous or occasionally with sparse appressed hairs on upper surface, sparse or moderately dense appressed hairs on lower surface; terminal leaflet 12–45(–60) mm long, 5–15(–20) mm wide, 1.2–6 times longer than wide, the laterals smaller, 10–30(–35) mm long, 2.5–12 mm wide, 1.5–6 times longer than wide; pulvinus 0.5–1.5 mm long, stipels 0.7–2.5 mm long. Inflorescences terminal, usually rather sparsely flowered, to 30 cm long, rachis glabrous or with uncinat and/or scattered to rather dense straight spreading hairs to 1 mm long; flowers single or in pairs, subtended by primary bract (2.5–)3–4.5 mm long, pubescent or hairs confined to margin; secondary bracts and bracteoles absent; pedicel 7–10 mm at anthesis, 15 mm long in fruit. Flowers: calyx 2.8–3.3 mm long, long straight hairs on lobes, the tube c. 1 mm, upper lobe divided to about the middle, 1.5–1.8 mm long, the others setaceous, 1.6–2.3 mm long, the lower slightly longer than the laterals; corolla pink to mauve with standard obovate, obtuse at the apex, 3.5–5 mm long, 2.5–3 mm wide, keel 3.5–4.5 mm long, slightly longer than the wings; stamens diadelphous; ovary densely pubescent. Pods straight, the upper suture continuous, not notched between articles, the lower slightly incised, the isthmus $\frac{1}{2}$ or more width of pod; with 4–6 articles, each (3.6–)4–5 mm long, 3–4 mm wide, transversely reticulately veined, moderately uncinat pubescent on faces with distinct marginal hairs; seed (2.3–)2.8–3.2 mm long, (1.6–)1.8–2.3 mm wide with distinct rim aril.

Selected specimens: Western Australia. Walsh Pt, Port Warrender, *Keighery* 4806 (PERTH); Mitchell Plateau mining camp, 14°26'S 125°47'E, Apr 1977, *George* 14480 (K, PERTH); Kimberley Research Station, Jul 1952, *Perry* 3036 (CANB, K, MEL, PERTH) & Mar 1963, *Lazarides* 6786 (CANB, PERTH). Northern Territory. 4 miles [6 km] N of 'Rankin', Mar 1956, *Chippendale* NT 1869 (DNA, MEL, PERTH); 12 km S of Katherine, 14°31'S 132°23'E, Apr 1988, *Pullen* & *Spottswood* 11172 (BRI, CANB, K); c. 26 miles [42 km]

NNW of 'Brunette Downs', May 1947, *Blake* 17813 (BRI, CANB, K, MEL). Queensland. BURKE DISTRICT: 30 miles [48 km] NNE of Camooweal, May 1948, *Perry* 982 (CANB, K); SW of Normanton, 17°45'S 140°57'E, Apr 1974, *Pullen* 8887 (CANB, K); NORTH KENNEDY DISTRICT: between Powelathunga and Charters Towers, 20°10'S 146°00'E, May 1988, *Pullen* 11250 (BRI, CANB).

Distribution and habitat: *Desmodium muelleri* ranges across northern Australia from the Kimberley region of Western Australia to south-western and north-central Queensland (near Charters Towers). It extends into semi-arid areas, and is virtually confined to heavy soils, often in grassland dominated by *Astrelba* spp. or *Dichanthium* spp. The western part of its range is rather fragmented, probably because of lack of suitable habitat. Map 27.

Affinities: *Desmodium muelleri* and *D. hannii* are closely related and are distinguished from other species of ser. *Stenostachys* (except perhaps from the poorly known *D. flagellare*) by pods not notched between the rather large articles. As Ohashi (1973) and Verdcourt (1979) pointed out, Knaap-van Meeuwen's referral of *D. muelleri* to *D. filiforme* is unacceptable.

16. *Desmodium glareosum* Pedley, sp. nov.
D. muelleri Benth. leguminis sutura supra continua non inter articulos acute incisa similis autem leguminis articulis et foliolis parvioribus differt; a *D. pullenii* Pedley pilis ramulorum foliolorumque albis incohaerentibus, foliolo terminali angustiore differt; a *D. filiforme* Zoll. et Moritzi leguminis sutura supra continua non inter articulos acute incisa, pilis ramulorum albis differt. **Typus:** NORTHERN TERRITORY: c. 8 miles [13 km] NNE of Edith River Siding, March 1965, *M. Lazarides* & *L.G. Adams* 115 (holo: CANB; iso: BRI, DNA, K, L, NSW).

Annual, erect or becoming prostrate, foliage described as greyish; stems with indumentum of usually weak moderately dense ascending (rarely appressed) white hairs 0.6–1 mm long. Leaves 3-foliolate; stipules narrow lanceolate, 1.5–4 mm long, 0.5–1.2 mm wide, with a few long hairs on the margins; petiole (0.5–)2.5–8 mm long, rachis 1.5–3.5 mm long; leaflets

oblong, obovate or almost orbicular, rounded or subcordate at the base, obtuse or retuse at apex, indumentum of weak, sparse to moderate loose ascending hairs c. 0.6 mm long on both surfaces; terminal leaflet 5–19(–26) mm long, 2.5–6.5(–11.5) mm wide, 1.4–4.5(–7) times longer than wide, lateral leaflets smaller, 3.5–13(–20) mm long, 1.8–6(–8.5) mm wide, 1.1–3.5(–4.5) times longer than wide; pulvinuses 0.5–1 mm long, stipels 0.3–0.6 mm long. Inflorescences terminal, rather open, to c. 10 cm long, the rachis with moderately dense, rather spreading hairs; flowers single, pedicels slender, 5–15 mm long, subtended by deciduous ovate pubescent bract 1.5–3 mm long; secondary bract and bracteoles absent. Flower: calyx 1.5–1.7 mm long, with indumentum of sparse spreading hairs to 0.8 mm long, tube 0.5–0.7 mm long, lobes c. 1 mm long, the upper divided to about the middle; corolla pink or mauve; standard c. 3 mm long and 2 mm wide; wings c. 2 mm long, 1 mm wide; keel petals slightly longer than the wings, 2–2.8 mm long; stamens diadelphous; ovary moderately pubescent with ascending hairs. Pods \pm straight, the upper suture \pm continuous (as in *D. muelleri*, *D. hannii* and *D. pullenii*), not notched between articles; isthmus $\frac{1}{2}$ – $\frac{2}{3}$ width of pod; lower suture deeply indented; with 2–4(–5) articles, each 2.5–3.4 mm long, 2.2–3(–3.3) mm wide, sparsely to moderately pubescent on faces, fringed on sutures, transversely reticulately veined; seeds 1.7–2.1 mm long, 1.4–1.8 mm wide, shining black when mature.

Selected specimens: Western Australia. Mitchell Plateau, 14°49'S 125°45'E, May 1988, *Pullen* 11219 (CANB). Northern Territory. Manton River, 12°50'S 131°10'E, May 1973, *Dunlop* 3146 (BRI, CANB, DNA, K, NSW); 11 km E of Katherine, 14°26'S 132°15'E, Apr 1977, *Pullen* 10592 (CANB, K, L); 16 km NE of Katherine, 14°24'S 132°22'E, Apr 1988, *Pullen* 11171 (AD, BRI, CANB, K, MEL, NSW, PERTH); 22 miles [35 km] N of Katherine, Feb 1965, *Wilson* 301 (BRI, CANB, DNA, K, L).

Distribution and habitat: The species has usually been recorded from gravelly soils, sometimes in disturbed situations such as roadsides. It is evidently sometimes associated with *D. pullenii*. It occurs in Western Australia (Mitchell Plateau and Weaber Range), and in the north-west of the Northern Territory. Map 28.

Affinities: *Desmodium glareosum* is a member of ser. *Stenostachys*, one of a group of species that includes *D. muelleri*, *D. hannii* and *D. pullenii* with the upper suture of the pod \pm continuous (only slightly undulate) not sharply notched between articles. It is most closely related to *D. pullenii*.

Etymology: The specific epithet is Latin *glareosum*, gravelly, a reference to the usual substrate of the species.

17. *Desmodium pullenii* Pedley, sp. nov.
similis *D. muelleri* Benth. leguminis sutura supra continua inter articulos non incisa autem leguminis articulis seminibusque parvioribus, foliolis interdum parvioribus pilis ramulorum aliquantum densis flavidis curvatis differt. **Typus:** Northern Territory. 12 km S of Hayes Creek, 13°35'S 131°30'E, April 1988, *R. Pullen & Spottswood* 11169 (holo: CANB; iso: BRI, DNA, NSW, PERTH).

Desmodium sp. (Laura V.J. Neldner + 3836)
Pedley in Henderson: Queensland Plants: Names & Distribution: 79 (1997).

Weak erect annual herb to c. 30 cm high; stems with indumentum of sparse to moderately dense stiffly spreading or curved hairs 0.5–1 mm long. Leaves trifoliolate; stipules deltoid to lanceolate, 2.5–6 mm long, glabrous or with a few marginal hairs; petioles 3–13 mm long, rachis 1.5–6.5 mm long; leaflets obovate or oblong, rounded at the base, obtuse or slightly retuse at the apex, upper surface with sparse appressed or rarely ascending hairs, rarely glabrous, lower surface appressed pubescent, hairs 0.5–1 mm long; terminal leaflet 7–22(–27) mm long, 4.5–11 mm wide, 1.4–2.5(–4) times longer than wide, lateral leaflets somewhat smaller, 5–17(–23) mm long, 3.2–8(–9.5) mm wide, 1.2–2.5 very rarely to 4.5 times longer than wide; pulvinuses and stipels 0.5–1.3 mm long. Inflorescence open, to 20 cm long, rachis with weak long spreading (rarely appressed) usually yellowish hairs; flowers single along the rachis; primary bract 2–3 mm long, deciduous; secondary bract and bracteoles absent; pedicels filiform 5–14 mm long. Flowers: calyx 1.5–2 mm long with short

(0.1–0.3 mm) spreading hairs, tube 0.4–0.6 mm long, lobes about of equal length, 1.2–1.5 mm long, the upper bifid to 0.3–0.5 mm; corolla ranging in colour from white through pink to pale purple, usually described as pink: standard obovate occasionally somewhat truncate at apex, 3–4 mm long, 2.4–2.7 mm wide, wings 2–2.5 mm long, c. 1 mm wide, shortly clawed; keel petals longer than wings, 3–4 mm long, about as wide; stamens diadelphous; ovary pubescent. Pods straight, upper suture continuous, not sharply notched between articles, lower incised, isthmus $\frac{1}{2}$ – $\frac{3}{4}$ width of pod; with usually 4 or 5 articles, each 2.7–3.5 mm long, 2.5–3.2 mm wide, moderately densely uncinat pubescent with fringe of hairs, occasionally becoming glabrous, transversely reticulately veined; seeds 1.8–2.2 mm long, 1.5–1.7 mm wide, shining black at maturity, with a small rim aril.

Selected specimens: Lesser Sunda Islands. Alor: Landschaft Kei, Moroe-Gendok, May 1938, *O. Jaag* (L). Western Australia. 5 km N of Port Warrender road, Mitchell Plateau, 14°45'S 125°46'E, May 1988, *Pullen* 11222 (CANB, PERTH); 2.9 km SE of Mitchell Plateau mining camp 14°50'S 125°51'E, Apr 1977, *George* 14504 (AD, MEL, PERTH). Northern Territory. Beatrice Hill [12°39'S 131°19'E], Mar 1961, *Chippendale* NT 7963 (CANB, DNA); 25 km W of Mary River, 12°52'S 131°48'E, Mar 1978, *Macnochie* 2332 (AD, BRI, CANB, K, MEL); Katherine Gorge National Park, 14°20'S 132°25'E, Apr 1981, *Craven* 6708 (CANB). Queensland. COOK DISTRICT: Endeavour River, in 1878, *Persietz* 232 (MEL); Yorkey's Knob Beach [16°49'S 145°43'E], Apr 1962, *McKee* 9011 (BRI, CANB, K); NORTH KENNEDY DISTRICT: Castle Hill, Townsville, [19°16'S 146°45'E], Nov 1947, *Shaw* 5507 (CANB).

Distribution and habitat: In Australia *D. pullenii* ranges across northern parts from the north of Western Australia to about Gladstone in central Queensland. It occurs on sand dunes and in eucalypt communities usually on sandy soils, but it has also been recorded from clay. It has also been collected in the Lesser Sunda Is. Map 29.

Affinities: The species belongs to ser. *Stenostachys* and is closely related to *D. glareosum* which has long loose white hairs on the stems and leaves, and usually narrower terminal leaflets. The Malesian specimen cited was determined by Knaap-van Meeuwen as *D.*

filiforme and she probably included *D. pullenii* in her wide circumscription of that species. Schindler annotated some specimens in herb. Kew as *D. muelleri* var. *minus* and the name has been used in other herbaria though never validated.

Etymology: The epithet honours Mr Roy Pullen, formerly of CSIRO, Canberra, whose field, herbarium and other studies of *Desmodium* in Australia have made this account of the genus possible.

18. *Desmodium heterocarpon* (L.) DC., Prodr. 2:337 ('heterocarpon'); Liu & Chuang, Taiwania 8:80 t. 9 (1962); Fosberg, Micronesiaca 2:145 (1966); Schubert, Fl. Trop. East Africa. Legum. Papilion. 462 (1971); Ohashi, Ginkgoana 1:120 (1973), Man. Flow. Pl. Hawai'i 1:667 (1990), J. Jap. Bot. 66:14 (1991) & (in part) Fl. Camb. Laos Vietn. 27:136 (1994); Verdcourt, Man. New Guinea Leg. 399 (1979); Pedley, Rev. Handb. Fl. Ceylon 10: 187 (1996); *Meibomia heterocarpa* (L.) Kuntze, Rev. Gen. 1:198 (1891); *Hedysarum heterocarpon* L., Sp. Pl. 747 (1753). **Type:** Herb. Hermann vol. 2 fol. 32, No. 94, left-hand specimen lecto: BM, *fide* Pedley in Turland & Jarvis (1997).

Desmodium polycarpon (Poir.) DC., Prodr. 2:334 (1825) (as 'polycarpum'); Benth., Fl. Austr. 2:235 (1864); *Hedysarum polycarpon* Poir. in Lam., Encycl. Meth. 6:413 (1805). **Type:** 'Indes orientales in herb. Lam' (P, n.v.).

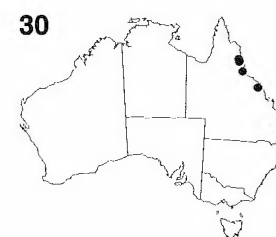
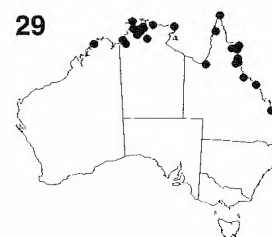
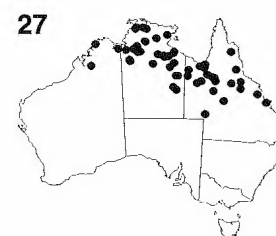
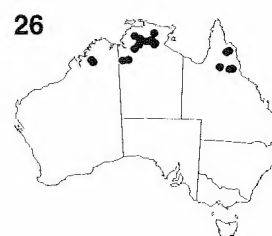
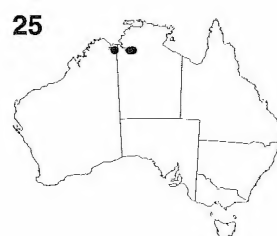
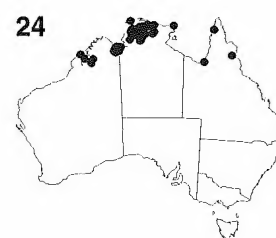
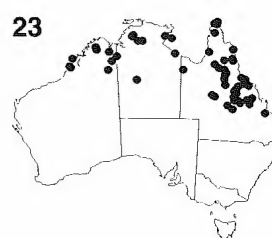
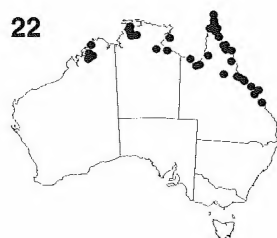
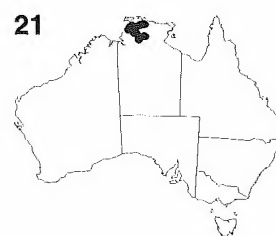
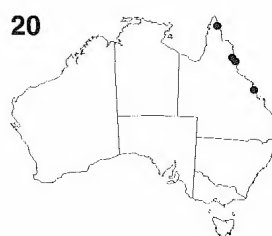
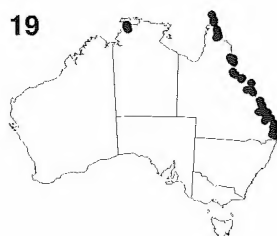
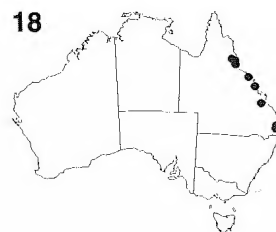
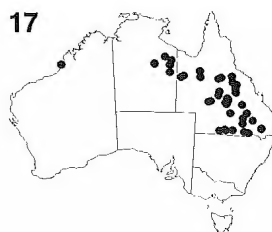
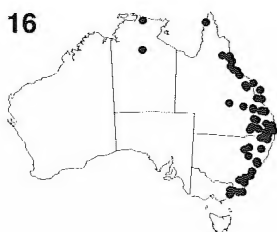
Hedysarum tuberosum Labill., Sertum Austro-Cal. 71 t. 72 (1824). **Type:** New Caledonia, La Billadière (n.v.).

Desmodium trichocaulon DC., Prodr. 2:335 (1825); Benth., Fl. Austr. 2:235 (1864). **Type:** Nepal, *Wallich* (G-DC, n.v.; microfiche, BRI).

Two varieties occur in Australia.

18a. *Desmodium heterocarpon* (L.) DC. var. *heterocarpon*

Rachis of inflorescence with sparse short erect uncinat hairs.



16. *Desmodium brachypodium*
 19. *Desmodium triflorum*
 22. *Desmodium trichostachyum*
 25. *Desmodium flagellare*
 28. *Desmodium glareosum*

17. *Desmodium campylocaulon*
 20. *Desmodium heterophyllum*
 23. *Desmodium filiforme*
 26. *Desmodium hamii*
 29. *Desmodium pullenii*

18. *Desmodium microphyllum*
 21. *Desmodium pycnotrichum*
 24. *Desmodium brownii*
 27. *Desmodium muelleri*
 30. *Desmodium heterocarpon* var. *heterocarpon*

Selected specimens: **Queensland.** COOK DISTRICT: Cooktown, Jan 1958, *Blake* 21218 (BRI); Mt Molloy, Apr 1962, *McKee* 9127 (BRI); SOUTH KENNEDY DISTRICT: Mt Fox, Sep–Dec 1949, *Clemens* s.n. (ex Univ. Michigan) (BRI, K); MORETON DISTRICT: Petrie, in 1931, *Blake* s.n. (K). **New South Wales.** Lismore, Mar 1893, *Bauerlen* 985 (NSW).

18b. *Desmodium heterocarpon* var. *strigosum* Meeuwen, Reinwardtia 6:95 (1962). **Type:** New Guinea, *Kalkman* B.W. 3596 (holo: L, n.v.).

Rachis of inflorescence with dense long straight white or yellowish hairs.

Selected specimens: **Northern Territory.** Port Essington, *Armstrong* 373 (K); Bamboo Pass, Marrakai road, Mar 1967, *Byrnes* 211 (AD, DNA); Holmes Jungle, 8 miles [13 km] E of Darwin, Mar 1961, *Chippendale* NT 7902 (DNA, MEL). **Queensland.** Cook District: Lockerbie, 10°48'S 142°28'E, Apr 1948, *Brass* 18437 (BRI, CANB); Endeavour River, Jun 1819, *Cunningham* 244 (K, MEL); MORETON DISTRICT: Buderim, in 1912, *Longman* s.n. (K). **New South Wales.** Along Bonalbo road, north of Bottle Tree village, 28°48'S 152°39'E, May 1973, *Tindale* 2094 (MEL, NSW).

Distribution and habitat: The species is widely distributed in the Old World: Africa, Sri Lanka, India, south-eastern Asia, Malesia and throughout the Pacific. In Australia it ranges from north-eastern New South Wales, through eastern Queensland to the northern part of the Northern Territory, usually in eucalypt communities on well drained soils, occasionally a weed in disturbed situations. Maps 30,31.

Affinities: *Desmodium heterocarpon* is one of the four species of sect. *Nicolsonia* (subg. *Sagotia*) that occur in Australia, but is not closely related to the others. Ohashi (1991) recognised eight infraspecific taxa, including one based principally on flower colour. Both Australian varieties are referred to subsp. *heterocarpon*. *D. heterocarpon* var. *strigosum* is much the commoner of the two, as it is in Africa, New Guinea and the Pacific.

Typification: In the protologue of *Hedysarum heterocarpon*, Linnaeus quoted specific differential characters from his own *Flora Zeylanica* and J. Burman's *Thesaurus Zeylanicus*. The specific differential characters in both these works emphasised that pods on the lower part of the plant are one-seeded (*Flora Zeylanica*:

'leguminibus articulatis: infimo monospermo'; *Thesaurus Zeylanicus*: 'siculis inferioribus solitariis: superioribus articulatis'). Burman's plate cited by Linnaeus does show pods with, in the lower part of the plant, one article, but none of the five specimens in herb. Hermann, only one of which has pods, has a one-seeded pod. It could be argued that since none of Hermann's specimens agrees with the protologue and Burman's plate does, then, if the species is to be lectotypified, Burman's plate should be chosen as the type. Unfortunately the plate is not a good depiction of the species currently accepted as *H. heterocarpon*: the shape of the leaflets is not at all typical and more importantly the fruiting inflorescences are shown as being rather open with the pods not appressed to and hiding the rachis as they usually do. Since other species (for example, *Hedysarum diphyllum*, *H. pulchellum* and *H. umbellatum*) are so well illustrated in *Thesaurus Zeylanicus* as to be instantly recognisable, one is left with some doubt as to whether the plant illustrated is the *H. heterocarpon* of herb. Hermann. This doubt is deepened by the fact that though I have examined scores of specimens of *H. heterocarpon* collected throughout its range I have not seen a specimen with pods with only one article. In view of this doubt, my general reluctance to typify a name with a plate when a specimen is available, and a desire to preserve nomenclatural stability, I lectotypified *Hedysarum heterocarpon* L. on herb. Hermann vol. 2 fol. 32, the left-hand specimen. The specimen bears flowers, but not pods, and shows both upper and lower surface of leaflets and the characteristically dense inflorescence with the rachis uncinately pubescent.

19. *Desmodium strigillosum* Schindl., Bot. Jahrb. 54:57 (1916); Gagnepain, Fl. Gen. Indochin. 2: 583 (1920); Ohashi, Ginkgoana 1:233 t.32a, fig. 63, 64 (1973); Dy Phon et al., Fl. Camboge, Laos, Vietnam 27: 129 t.27 (1994). **Type:** Vietnam. Saigon, November 1864, *Lefevre* s.n. (lecto: P, n.v., *fide* Ohashi).

Selected specimens: **Vietnam.** Onorlei, dans les lieux incults, Nov 1885, *Balansa* Pl. du Tonkin 1250 (K, paralectotype). **Queensland.** COOK DISTRICT: Andoom Top Camp, 20 km N of Lorim Point, 12°29'S 141°50'E, Mar. 1981, *Morton* AM 1153 (BRI); Cooktown, Jan 1958,

Blake 20218 (BRI); 2.5 km S of Mt Molloy on road to Mareeba, 16°42'S 145°20'S, Jan 1982, *Clarkson* 6756 & *McDonald* (BRI).

Distribution and habitat: The species has previously been recorded only from south-east Asia (Burma, Cambodia, Laos and Vietnam, *fide* Dy Phon et al.) at altitudes of 700–800m (though the lectotype is evidently from Saigon!). In Queensland it was first collected at Cooktown in 1958 and seems to be a recent introduction. It now occurs at rather low elevations in the Mareeba-Cooktown area and at the extreme north of the west coast of Cape York Peninsula. Map 32.

Affinities: It is probably most closely allied to *D. heterocarpon* from which it differs, most obviously, in its lanceolate leaflets, large flowers and reflexed pods.

- 20. *Desmodium nemorosum*** F. Muell. ex Benth., Fl. Austr. 2:234 (1864); Ohashi, Ginkgoana 1:218 (1973), excl. var. *whitfordii*; Verdcourt, Man. New Guinea Leg. 403 (1979); *Meibomia nemorosa* (F. Muell. ex Benth.) Kuntze, Rev. Gen. 1:198 (1891). **Type:** Brisbane River, *Mueller* (syn: K); Pine River, *Fitzalan* (syn: K); sine loc., *Leichhardt* (syn: K; iso?: NSW).

Desmodium nemorosum var. *simplex* Schindl., Rep. sp. nov. reg. veg. 21:10 (1925). **Type:** none designated.

Desmodium nemorosum subvar. *eboracense* Schindl., Rep. sp. nov. reg. veg. 21:10 (1925). **Type:** Cape York, *Daemel* (iso: BM).

Desmodium nemorosum var. *novoguineense* Kaneh. & Hatus., Bot. Mag. Tokyo 56:366 (1942). **Type:** New Guinea. Vogelkop, Warren, 60 miles [96 km] S of Manokwari, Mar 1940, *Kanehira* & *Hatusima* 12930 (holo: FU, n.v.; photo: K).

Desmodium archboldianum E.G. Baker, Brittonia 2:318 (1937). **Type:** Papua New Guinea. Western District: Wuroi, Oriomo River, Jan 1934, *Brass* 5732 (holo: BM; iso: BRI, L).

Selected specimens: **Queensland.** COOK DISTRICT: Newcastle Bay [10°49'S 142°26'] May 1948, *Brass* 18763 (BRI, CANB); NORTH KENNEDY DISTRICT: Mt Fox [18°51'S 145°48'E], Dec 1949, *Clemens* (CANB); MORETON DISTRICT: Bellthorpe–Jimna road, 26°44'S 152°35'E, alt. 600m, Jan 1990, *Weston* 1469 & *Richards* (BRI, NSW); Tamborine Mtn, Jan 1916, *White* s.n. [AQ 097953] (BRI). **New South Wales.** 5 miles [8 km] N of Iluka, Jun 1966, *Boyd* & *McGillivray* 2008 (NSW); Port Macquarie, May 1819, *Cunningham* 41 (K) & Feb 1898, *Boorman* (NSW); Camden Haven, Jan 1882, *Betche* (NSW 105278).

Distribution and habitat: *Desmodium nemorosum* extends from New Guinea through coastal parts of eastern Queensland to north-eastern New South Wales, in higher rainfall areas in eucalypt open-forest and on margins of rainforest. Though widespread, it is nowhere common, and appears to be absent from central Queensland between about 20°S and 25°S. Map 33.

Affinities: The species differs from *D. heterocarpon* the other species of sect. *Nicolsonia* mainly in its elongate articles 5–7 mm long and its more elongate leaflets. Like *D. heterocarpon*, *D. nemorosum* shows a wide variation in size in both foliar and floral parts, but unlike *D. heterocarpon* it cannot be divided into infraspecific taxa. *D. nemorosum* subvar. *whitfordii* Schindl. (*D. nemorosum* var. *whitfordii* (Schindl.) Ohashi), syntypes of which I have seen (herb. Kew), is best considered a distinct species with a restricted range in the Philippines some 2500 km from Vogelkop the nearest known occurrence of *D. nemorosum* in New Guinea. It has distinctly ovate leaflets with dense long appressed silky hairs on their undersides. Specimens from Australia referred to *D. nemorosum* var. *whitfordii* by Ohashi are well within the normal range of variation of *D. nemorosum* var. *nemorosum*.

Desmodium whitfordii (Schindl.) Pedley, **comb. nov.**

Desmodium nemorosum subvar. *whitfordii* Schindl., Rep. sp. nov. reg. veg. 21:10 (1925). **Types:** Philippines. Luzon: Bataan Prov., Lamao River, Mt Marweles (Herb. Bur. Gov. Lab. No. 227 leg. *H.N. Whitford*; Herb. Bur. Sci. No. 7611 leg. *E.D. Merrill*.) (isosyn: K).

- 21. *Desmodium tiwiense* Pedley, sp. nov.**,
affinis *D. nemorosum* F. Muell. ex Benth.
a qua foliis semper unifoliolatis, foliolis
orbicularibus (non ovatis ellipticisve)
infra minor dense pubescentibus et venis
lateralibus paucioribus ornatis et
leguminibus margine inferiore minor
valde inciso et articulis paucioribus
differt. **Typus:** Northern Territory:
Bathurst Island, Runku, 11°36'59"S
130°16'35"E, 27 March 1995, I.D. Cowie
5424 (holo: DNA; iso BRI, K, & (n. v.)
CANB, L, MEL, NSW, PERTH).

Perennial trailing herb; stems terete with indumentum of dense spreading or ascending white hairs (to 0.7 mm long). Leaves 1-foliolate; stipules brown scarious, long-pointed, somewhat asymmetrical at the base, 7–10 mm long, 1.2–2 mm wide; petiole 12–16 mm long; leaflets more or less orbicular, cordate at the base, obtuse at the apex, glabrous above, moderately appressed pubescent below, with c. 7 pairs of lateral veins not reaching the margin, (25–)30–36 mm long, (25–)28–32 mm wide; pulvinus 1–1.5 mm long; stipels filiform 3–4 mm long. Inflorescences terminal, open, to 12 cm long, rachis pubescent with moderately dense, slightly retrorse, uncinat hairs; flowers in pairs subtended by a deciduous ovate acuminate bract c. 3 mm long, secondary bracts and bracteoles absent; pedicels 2–3 mm long. Flowers: calyx c. 3 mm long, very shortly uncinately pubescent and with a few long hairs at the base, tube c. 1 mm long, all lobes triangular c. 2 mm long, the upper shortly bifid at the tip; corolla white or yellowish, standard orbicular, emarginate at the top, 5.5 mm long, 6.5 mm wide, wings oblong c. 5 mm long (including claw c. 1 mm), keel petals about as long as wings; stamens rather stout; ovary appressed pubescent. Pod to 25 mm long with 5 or 6 articles, upper suture straight or slightly sinuate, not notched between articles, lower shallowly indented (less than ¼ width of pod) between articles; articles quadrate 3–3.5 mm long and wide, with sparse uncinat hairs, denser on margins, transversely reticulately nerved; seed c. 2 mm long and 1.5 mm wide with a small rim aril.

Other specimens (all DNA): Northern Territory. Melville Island, 11°28'S 130°30'E, Feb 1987, *Fensham*

445; Cape Gambier, Melville Is., 11°52'S 130°40'E, May 1988, *Fensham* 828; Melville Is., 11°42'S 130°42'E, Apr 1987, *Fensham* 508; Melville Is., Penell Beach to MacClear Creek Rd, Jun., 11°49'S 130°54'E, Jan 1992, *Leach* 2938 & *Cowie*.

Distribution and habitat: The species has a limited geographic range, restricted to Bathurst and Melville Islands in the extreme north-west of the Northern Territory where it occurs in eucalypt communities on sandy or gravelly soils. Map 34.

Affinities: *Desmodium tiwiense* is most closely related to *D. nemorosum* which usually has trifoliolate leaves, narrower leaflets more densely pubescent beneath with more lateral veins, the lower margin of the pod more deeply incised, and larger pod articles.

Etymology: Bathurst and Melville Islands are the traditional home of the Tiwi people and are often known as the Tiwi Islands. The specific epithet is a combination of *tiwi*, and the Latin suffix (neuter) *-ense*, place of origin.

- 22. *Desmodium velutinum* (Willd.) DC.**,
Prodr. 2:328 (1825); Schubert, Fl. Congo
Belge 5:194 (1954) & Fl. Trop. East
Africa. Legum.: Papilion.: 466 (1971);
Ohashi, Ginkgoana 1:192 (1973) & Fl.
Camb. Laos Vietn. 27:117 (1994);
Verdcourt, Kirkia 9:518 (1974), Manual
New Guinea Leg. 411 (1979); Pedley,
Rev. Handb. Fl. Ceylon 10:183 (1996);
Meibomia velutina Willd., Sp. Pl.
3(2):1174 (1802). **Type:** herb. Willdenow
13763 (holo: B; microfiche, BRI).

Selected specimens: Northern Territory. Mt Bundy, 12°52'S 131°38'E, Apr 1969, *Byrnes* 1486 (DNA, K); 9 km N of Cannon Hill, 12°17'S 132°55'E, Jun 1983, *Russell-Smith* 699 (DNA); Bamboo Pass, 12°55'S 131°15'E, Mar 1968, *Byrnes* 213 (AD, DNA).

Distribution and habitat: In Australia confined to the extreme north-west of the Northern Territory where it occurs in eucalypt communities and on margins of closed communities. It may have been introduced into Australia in recent years as all collections have been made since 1965. It is widespread in Africa, south-east Asia and Malesia. Map 35.

Affinities: With *D. gangeticum* it is the only representative of sect. *Heteroloma*, but it is not

particularly closely related to *D. gangeticum* or any other species of the section. Ohashi recognised two subspecies, one with two varieties. Australian specimens are referable to *D. velutinum* var. *velutinum*.

- 23. *Desmodium gangeticum* (L.) DC., Prodr.** 2:327 (1825); Schubert, Fl. Congo Belge 5:196 (1954), J. Arn. Arb. 44:294 (1963) & Fl. Trop. East Africa. Legum. Papilion. 467. t. 65 (1971); Ohashi, Ginkgoana 1:184 (1973) & Fl. Camb. Laos Vietn. 27:121 (1994); Verdcourt, Man. New Guinea Leg. 397 (1979); Pedley, Rev. Handb. Fl. Ceylon 10:182 (1996); *Meibomia gangetica* (L.) Kuntze, Rev. Gen. 1:196 (1891); *Hedysarum gangeticum* L., Sp. Pl. 746 (1753). **Type:** *Hedysarum* no. 13 (LINN).

Selected specimens: Western Australia. Junction of Broc kman R. & Calder R., 16°17'S 125°00'E, May 1983, *Milewski* (K, PERTH). Northern Territory. Victoria River, *Mueller* (K); 43 miles [69 km] ENE of Pine Creek, Mar 1965, *Lazarides & Adams* 193 (CANB); 5 miles [8 km] S of Batchelor, Mar 1965, *Muspratt* 112 (AD, DNA, MEL, NSW). Queensland. NORTH KENNEDY DISTRICT: Ayr, 19°34'S 147°24'E, Jun 1951, *Kleinschmidt* K145 (CANB); PORT CURTIS DISTRICT: Gladstone, *Dietrich* 41 (MEL); MORETON DISTRICT: near Sidling Creek, *Petrie* 18 miles [29 km] N of Brisbane, Mar 1931, *Blake* 2349 (BRI, K).

Distribution and habitat: *Desmodium gangeticum* has a wide geographic range in the Old World: Africa, Sri Lanka, India, Indo-China and Malesia. In Australia it is found from north-eastern New South Wales, through eastern Queensland to the northern part of the Northern Territory and the Kimberley region of Western Australia. It is nowhere common and little is known of its ecology except that it occurs in eucalypt communities; it may have been introduced in some places. Map 36.

Affinities: Ohashi referred *D. gangeticum* with *D. velutinum* to sect. *Heteroloma* Benth. though the relationship between the two is not close. The nearest relative of *D. gangeticum* is possibly *D. pryonii* DC. which is restricted to Sri Lanka and the extreme south of Peninsular India.

- 24. *Desmodium rhytidophyllum* F. Muell. ex Benth., Fl. Austr. 2:233 (1864);** *Meibomia rhytidophylla* (F. Muell. ex Benth.) Kuntze, Rev. Gen. 1:198 (1891). **Types:** Port Jackson, *Brown* (syn:K);

Parramatta, *Woolfs* (syn:K, MEL); between Burnett and Dawson, *Mueller* (syn:K); Queensland (cited by Bentham as 'near Rockhampton'), *Dallachy* (syn: K).

Trailing perennial herb; branchlets with indumentum of brown spreading hairs c. 0.5 mm long; stipules deltoid or ovate acuminate, 3–5 mm long, 1–2 mm wide, densely hairy outside, glabrous, striate inside. Leaves 3-foliate; petiole with indumentum of branches, 8–30 mm long, rachis 3–9 mm long, petiolules 1–2 mm long, stipels 0.7–1.7 mm long; terminal leaflets rhomboid (rarely obovate or orbicular), obtuse or rarely emarginate, discolorous with \pm dense spreading hairs on both surfaces, becoming sparser on upper surface, 17–45(–55) mm long, (10–)15–30 mm wide, (1–)1.5–1.8(–2.1) times longer than wide, lateral ones smaller and often oblique 14–35(–40) mm long, 10–25 mm wide, 1.3–1.8 times longer than wide. Inflorescence terminal, to 25 cm long, rather open, axis with dense indumentum of hooked hairs; flowers in fascicles of 2 or rarely 3; primary bracts 2–3 mm long, secondary bracts c. 1 mm long; pedicels 2–4 mm long. Flowers pink or purplish: calyx 4-lobed, 3–3.3 mm long, the tube hirsute 1–1.3 mm long, the lobes c. 2 mm long, the lower and lateral ones subulate, the upper wider, minutely bifid at the tip; corolla standard obovate, sometimes shortly clawed, 4.3–5.3 mm long, 4–4.5 mm wide, wings 3.7 mm long, 1.5 mm wide, somewhat auriculate, on a claw c. 1.5 mm long, keel petals 3.5–4 mm long, 1.5–2 mm wide on a claw 1.5–2 mm long; stamens diadelphous; ovary with indumentum of hooked hairs. Pod straight with up to 6 articles, upper suture and lower margin incised, the lower slightly more than the upper, the isthmus c. $\frac{1}{2}$ width of articles; articles transversely ovate, 3.5–4 mm long, 2.5–3 mm wide, reticulately veined with moderately dense indumentum of uncinate hairs. Mature seeds not seen.

Selected specimens: Papua New Guinea. CENTRAL DISTRICT: Port Moresby subdistrict, Lake Myola swamp grassland, 9°9'S 147°43'E, Sep 1973, *Croft & Lelean* NGF 34642 (BRI). Northern Territory. Gimbat, source of South Alligator River, 13°45'E 132°48'E, *Russell-Smith* 734 (DNA). Queensland. COOK DISTRICT: Tolga, 17°13'S 145°29'E, Apr 1962, *McKee* 9405 (CANB, K, NSW); LEICHHARDT DISTRICT: Blackdown Tableland, c. 23°50'S 149°00'E, Apr 1971, *Henderson* et al. 671 (BRI,

K, MEL); BURNETT DISTRICT: Eidsvold, 25°22'S 151°07'E, Apr 1963, *McKee* 10219 (CANB, NSW). **New South Wales.** Brunswick Heads, Feb 1971, *O'Hara & Coveny* 3476 (K, NSW); Colo River Bridge, c. 12 miles [19 km] N of Windsor, Mar 1967, *Constable* 7347 (K, NSW); Huskisson, Jervis Bay, Feb 1941, *E.C. McDonald* 143 (K).

Distribution and habitat: The species ranges from the Atherton Tablelands of north Queensland through coastal and subcoastal areas to the South Coast District of New South Wales, with isolated occurrences in the Northern Territory and in Papua New Guinea. It is often a prominent member of the ground layer vegetation of open eucalypt communities, usually on well drained soils. It also occurs in New Caledonia. Map 37.

Affinities: As Bentham noted in his protologue *D. rhytidophyllum* has some affinity with *D. varians*, but the relationship is not close. It is however, close to *D. tenax* (which Verdcourt (1979) treated as a subspecies of *D. rhytidophyllum*) and *D. macrocarpum* but all are rather isolated among species of sect. *Heteroloma* Benth.

25. *Desmodium tenax* Schindl., Rep. sp. nov.
reg. veg. 21:10 (1925). **Type:** Rockingham Bay, *Dallachy* (n.v.).

D. rhytidophyllum subsp. *acutifoliolum* Verdc., Kew Bull. 32:250 (1977) & Man. New Guinea Leg. 406 (1979). **Type:** Papua New Guinea. WESTERN DISTRICT: Moreshead Subdistrict: Wassi Kussi River, Arufi, Jul 1968, *Henty & Katik* NGF 38667 (holo: K).

Sprawling shrub to c. 1 m tall; branchlets with indumentum of brown spreading hairs similar to those of *D. rhytidophyllum*; stipules lanceolate acute, to c. 6 mm long, densely hairy outside, glabrous inside. Leaves trifoliate; petiole 10–40 mm long, rachis 8–20 mm long; leaflets ovate with a long acute apex, upper surface with sparse, appressed to ascending hairs, lower surface with moderately dense usually ascending hairs; terminal leaflet 65–105 mm long, 40–55 mm wide, 1.5–2.3 times longer than wide, laterals less attenuate, smaller, 42–60 mm long, 22–35 mm wide, 1.3–2 times longer than wide; pulvinuses 2–2.5 mm long, stipels 1.5–2.5 mm long. Inflorescences

terminal and in upper axils, to 200 mm long, rachis with indumentum of hooked hairs; fascicles of usually 2 flowers, primary bract 2–3 mm long, secondary c. 1.5 mm, both deciduous, bracteoles absent; pedicels to c. 3 mm long. Flowers pink or purple, similar to those of *D. rhytidophyllum* though perhaps standard smaller. Pods indented on both upper and lower sutures, the lower more deeply, isthmus about $\frac{1}{3}$ width of pod, of up to 6 articles, each triangular, 5.5–8 mm long, 3.4–4 mm wide, reticulately veined with sparse uncinat hairs; seed (only 1 measured) 3.5 mm long, 2.2 mm wide.

Selected Specimens: **Queensland.** COOK DISTRICT: Lockerbie Scrub, 10°47'S 142°29'E, Feb 1990, *Forster* PIF 6325 (BRI); Iron Range [12°44'S 143°17'E] Jun 1948, *Brass* 19320 (BRI, CANB, K); McIlwraith Ra., 13°42'S 143°18'E, Jun 1992, *Forster* PIF 10247 (BRI); NORTH KENNEDY DISTRICT: Mt Fox [18°51'S 145°48'E], Nov 1949, *Clemens* s.n. [AQ 417008] (BRI).

Distribution and habitat: The species ranges from southern New Guinea to Mt Fox, a little north of Townsville, Queensland. It has been collected in eucalypt-Melaleuca communities, but is evidently rare. Map 38.

Affinities: As Schindler noted in the protologue of the species, it differs from *D. rhytidophyllum* on its larger acute leaflets and larger pods, and they are obviously closely related.

26. *Desmodium macrocarpum* Domin, Biblioth. Bot. 89:214 (1926). **Type:** in xerodrymio ad opp. Jericho, Mar 1910, *Domin* 4744 (holo: PR 527366).

Subshrub woody at the base, with ascending stems to c. 0.5 m tall; branchlets with rather dense indumentum of erect, slightly uncinat, stiff hairs to 0.5 mm long; stipules ovate, acuminate, 5–6 mm long, c. 3 mm wide, longitudinally veined, pubescent. Leaves 1- or rarely 3-foliate; petiole 25–50 mm long; leaflets ovate or rhombic (or laterals oblong-orbicular), obtuse, mucronulate at the apex, truncate or subcordate at the base, with moderately dense short stiff hairs on both upper and lower surfaces; terminal leaflets 25–30 mm long, 20–40 mm wide, 1.2–1.6 times longer than wide, laterals about half as large; pulvinuses 2–3 mm long, stipels 2.5–4 mm

long, setaceous. Inflorescences terminal and in upper axils, to c. 200 mm long, rachis with indumentum similar to that of branchlets; fascicles of 2 flowers; primary bracts similar to stipules, 3–5 mm long, 1.5 mm wide, secondary bracts absent or early deciduous; bracteoles absent; pedicels 2–3 mm long. Flowers white or pale mauve; calyx 4-lobed, c. 4 mm long, pubescent with short stiff hairs, lobed to about the middle, the upper wider than the others, notched at the apex; standard orbicular, tapered to the base but not distinctly clawed, 6–6.5 mm long, 6.5–7 mm wide; wing 6–6.5 mm long, 2–3 mm wide including a distinct claw; keel petals about as long as the wings, slightly wider; stamens diadelphous; ovary with dense indumentum of short uncinuate hairs. Pod straight with up to 4 articles, upper suture straight, lower margin incised to c. $\frac{1}{2}$ width of pod; articles \pm triangular, 9–10 mm long, 5–6 mm wide, with dense indumentum of short stiff uncinuate hairs. Seeds brown, \pm oblong, 5–6 mm long, 3–3.5 mm wide, with a distinct rim aril.

Selected specimens: **Queensland.** NORTH KENNEDY DISTRICT: 40-mile scrub, 18°15'S 144°45'E, Feb 1972, *Irvine* 165 (BRI, QRS); LEICHHARDT DISTRICT: 'Redlands' 5 km W of Balfes Creek, [approx 20°15'S 145°55'E], Apr 1977, *Rehgetz* 355 (BRI); 'Kooralbyn' c. 24 km SSW of Duarina, 23°57'S 149°37'E, Mar 1984, *Anderson* 3660 & 3661 (BRI); BURNETT DISTRICT: 'Narayan' near Mundubbera, May 1988, *Hacker* JBH 870 (BRI).

Distribution and habitat: *Desmodium macrocarpum* is an uncommon plant known from several widely separated localities in eastern Queensland. It is found on sandy or loamy soil, sometimes shallow, usually in communities of *Eucalyptus crebra* F. Muell, sometimes with *Acacia shirleyi* Maiden. Map 39.

Affinities: As Domin stated the species is related to *D. rhytidophyllum*, but has usually unifoliate leaves, stiffer hairs and much larger pod articles.

27. *Desmodium gunnii* Benth. ex J.D. Hook., Fl. Tasmanicae 1:101 (1856); *D. varians* var. *gunnii* (Benth. ex J.D. Hook.) Benth., Fl. Austr. 2:233 (1864). **Type:** Tasmania, *Gunn* 243 (lecto: K, see below; isolecto: BM).

Sprawling or somewhat ascending perennial, sometimes rooting at the nodes; branchlets

terete, glabrous or with a few appressed hairs; stipules triangular, striate, 2–4 mm long, 1–2.5 mm wide at base. Leaves trifoliate, petioles 10–30 mm long, rachis minute or to 1 mm long, petiolules (i.e. pulvinuses) 0.6–1 mm long, stipels setaceous, 0.5–2 mm long, those of lateral leaflets longer than those of terminal one; leaflets cuneate and truncate at the apex, or rarely obovate and obtuse, the terminal 6–20 mm long, 7–11 mm wide, 0.8–1.5 times longer than wide, the laterals usually smaller, 6–18 mm long, 6.5–13 mm wide, 0.8–1.6 times longer than wide, subglabrous, a few hairs on veins on lower surface. Inflorescences terminal or in the upper axils, to 16 cm long, open, flowers solitary, bracts persistent, stipule-like to 1.7 mm long, pedicels with indumentum of hooked hairs, 1.5–7 mm long, bracteoles none. Flowers: calyx tube campanulate 1–1.2 mm long, the lobes broad 0.7–1 mm long; corolla pink or lavender, standard 3–3.3 mm long, the other petals longer, c. 3.5 mm long; stamens diadelphous; ovary appressed pubescent. Pods with up to 6 articles, the upper suture indented between the articles, the lower more deeply so; articles oblong, 4–5 mm long, 2–2.5 mm wide, with dense indumentum of spreading hooked hairs. Mature seeds not seen.

Selected specimens: **Queensland.** PORT CURTIS DISTRICT: Many Peaks Range, 24°10'S 151°17'E, Jun 1977, *Crisp* 2752 (CANB); Gladstone, *Dietrich* 215 (MEL); MORETON DISTRICT: Tamborine Mtn, Mar 1947, *Clemens* (K). **New South Wales.** Brindabella Range, 35°19'S 148°50'E, Jan 1977, *Crisp* et al. 2471 (CANB); Shoalwater River Gorge, 34°48'S 150°12'E, Feb 1974, *Pullen* 8794 (CANB). **Victoria.** Mallacoota Inlet, Dec 1969, *Beaglehole* 32372 & *Finck* (MEL); Sherbrooke, 37°54'S 145°21'E, Mar 1977, *Gullan* 62 & *Opie* (MEL).

Distribution and habitat: The species ranges from Papua New Guinea (one collection) through coastal parts of mainland eastern Australia to Tasmania, commonly in eucalypt open forest, usually in shady situations. It also occurs in New Caledonia. Map 40.

Affinities: *Desmodium gunnii* is close to *D. varians* to which Bentham referred it as a variety. It differs in the structure of its pod and its extremely short leaf rachis. Leaflets of *D. varians*, when extremely short, approach those of *D. gunnii* in size and shape, but whereas the leaves of *D. gunnii* are subdigitate with the leaf

rachis never exceeding 1 mm, those of *D. varians* are distinctly pinnate with the leaf rachis at least 1 mm longer and usually considerably more.

Typification: Hooker cited *Gunn* 243 as the type. In herb. K two sheets have been segregated as type material, one from Herbarium Hookerianum, the other from Herbarium Benthamianum. Thirty-two fragments are mounted on the sheets. Annotations and labels indicate that, in part, they represent *Gunn* 243, but more than one collection (including some by Milligan) is represented. Unfortunately five of the fragments are of *D. varians*. Despite the mixed material, Hooker's description applies to *D. gunnii*. I have therefore lectotypified the name by the fragments mounted on the sheet 'Herbarium Hookerianum 1867', excepting two sizeable fragments of *D. varians* on the sheet. This sheet has pinned to it a note and a field label both in Gunn's hand identifying it as his n. 243. The isolectotype at BM consists of six fragments all from Circular Head; none is *D. varians*.

28. *Desmodium varians* (Labill.) G. Don, Gen. Hist. Dich. Plants 2:298 (1832); Benth., Fl. Austr. 2:233 (1861); *Meibomia varians* (Labill.) Kuntze, Rev. Gen. 1:198 (1891); *Hedysarum varians* Labill., Sert. Austro-cal. 71 t. 71 (1824). **Type:** none designated.

Desmodium varians var. *angustifolium* Benth., Fl. Austr. 2:233 (1864). *Desmodium spartioides* DC., Prodr. 2:337 (1825). **Type:** ex herb. Lambert (G–DC, n.v., microfiche: BRI).

Desmodium dietrichiae Domin, Biblioth. Bot. 89(3): 213 (1926). **Type:** prope Brisbane River, Australia or., *Dietrich* 1450 (lecto: PR 527357, chosen here).

Sprawling perennial or tufted annual with stems arising from perennial rootstock; branchlets terete, glabrous or with a few appressed hairs; stipules deltoid or ovate acuminate, 2–5.5 mm long. Leaves trifoliolate, petiole 5–10 mm long, rachis 2–4.5 mm long; leaflets lanceolate, oblong or occasionally oblanceolate, rounded

or cuneate at the base, obtuse or slightly retuse at the apex, usually a few appressed hairs on the veins beneath; terminal leaflet 5–35 mm long, 4–5.5(–7) mm wide, 1–8.5 times longer than wide, lateral leaflets smaller, 3.5–26 mm long, 3–4.5(–6) mm wide, 1.2–8 times longer than wide; pulvinuses 0.5–1.5 mm long, stipels 0.4–1 mm long. Inflorescence terminal to c. 15 cm long in flower, elongating in fruit, the rachis glabrous except for some uncinat hairs near the tip, fascicles of 1–3 flowers, subtended by primary bract 1.5–3.5 mm long, deciduous; secondary bract usually 0.7–1 mm long, deciduous; bracteoles absent; pedicels 3–9 mm long with indumentum of uncinat hairs. Flowers: calyx 4-lobed, covered with short uncinat and longer straight hairs, tube 1.2–1.5 mm long, the lobes all of about equal length, 1.2–1.6 mm long, the upper \pm entire or divided to about the middle; corolla pink or purplish; standard orbicular, about 6 mm long and wide, wings about 5 mm long, 2.5 mm wide, with claw c. 2 mm long, keel petals somewhat shorter than the wings. Pods with 4–6 articles, the upper suture thickened, somewhat undulate, the lower deeply indented, the isthmus $\frac{1}{3}$ – $\frac{1}{2}$ width of pod; articles 3.5–4.2 mm long, 2.7–3.8 mm wide, with moderate to dense indumentum of uncinat hairs; seeds about 2.5 mm long, 1.6 mm wide with a distinct rim aril.

Selected specimens: New Caledonia. Wagap, Viellard 366 (K). Queensland. BURKE DISTRICT: 13 km N of turn-off to 'Gregory Springs', 19°40'S 144°14'E, May 1988, Pullen 11248 (CANB); LEICHHARDT DISTRICT: 8 miles [13 km] S of Springsure, Oct 1964, Adams 1391 (BRI, CANB, K); MORETON DISTRICT: Blunder Creek near Brisbane, Oct 1930, Hubbard 4713 (BRI, K). New South Wales. Yamba, 29°27'S 153°22'E, Feb 1973, Tindale 2038 (NSW); 30 miles [48 km] S of Tamworth, 31°31'S 150°51'E, Feb 1941, Roe R61 (CANB); Canberra, Nov 1960, McKee 7672 (CANB, K). Victoria. Dandenong Ranges, Belgrave, Dec 1932, Willis (MEL); Upper Turnback Creek, 37°06'S 148°22'E, Feb 1980, Walsh 352 (MEL). Tasmania. South Esk, in 1887, Oakden (MEL); without definite locality, Mueller (MEL).

Distribution and habitat: The species occurs over a wide area of eastern Australia, ranging from Tasmania through coastal districts of Victoria and subcoastal and coastal districts of New South Wales to north-central Queensland, usually on well drained soils in eucalypt communities. It also occurs in New Caledonia. Map 41.

Affinities: *Desmodium varians* is closely related to *D. gunnii* which Bentham treated as a variety of *D. varians*. The two are sympatric in many coastal areas but *D. gunnii* usually occurs in moister shaded situations. The species is variable and there are two different growth forms. In coastal areas the plant usually sprawls among grass but in inland areas which often have a marked dry season it often forms multistemmed tufts from a woody base. The latter may be merely first growth in response to rain, but possibly Bentham should be followed and two taxa recognised.

29. *Desmodium tortuosum* (Sw.) DC., Prodr. 2:332 (1825); Schubert, *Flora Trop. East Africa. Legum. Papilion.* 474 (1971); Verdcourt, *Kirkia* 9:256 (1974) & *Man. New Guinea Leg.* 408 (1979); Long & Lakela, *Fl. Trop. Florida* 487 (1971); Correll & Correll, *Fl. Baham. Arch.* 64 (1982); Liogier, *Fl. Española* 3:197 (1985); Howard, *Fl. Lesser Antilles* 4(1):482 (1988); Green, *Fl. Austral.* 49:179 (1994); Pedley, *Rev. Handb. Fl. Ceylon* 10:191 (1996); *Meibomia tortuosa* (Sw.) Kuntze, *Rev. Gen.* 1:198 (1891); *Hedysarum tortuosum* Sw., *Prodr. Veg. Ind. Occ.* 107 (1788). **Type:** Jamaica, Swartz (holo: S, *fide* Schubert, Howard, n.v.).

Desmodium purpureum (Miller) Fawcett & Rendle, *Fl. Jamaica* 4:36 (1920), non Hook. & Arn. (1832); *Hedysarum purpureum* Miller, *Gard. Dict.* ed. 8 no. 6 (1768). **Type:** Mexico, Vera Cruz, in 1730, Houston (holo: BM).

Selected specimens: **Western Australia.** Mitchell Plateau, 14°49'S 125°51'E, May 1978, *Kenneally* 6801 (K, PERTH). **Northern Territory.** Darwin, Oct 1946, *Blake* 17311 (BRI, K); Katherine, 14°28'S 132°16'E, Apr 1977, *Pullen* 10607 (CANB) & *Dunlop* 4182 (DNA). **Queensland.** COOK DISTRICT: Yorke Is., 9°45'S 143°24'E, Oct 1981, *Clarkson* 3972 (BRI, K, MBA); MORETON DISTRICT: Gatton, Apr 1947, *Everist* 2965 (BRI, K). **New South Wales.** Braidwood District, Jan 1885, *Bauerlen* 393 (MEL).

Distribution and habitat: *Desmodium tortuosum* is a native of subtropical and tropical America now naturalised in Africa and Asia. It was probably introduced to Australia as a green-manure crop but is widely (though not

commonly) naturalised in high rainfall areas in eastern coastal areas and in the north-west, usually on roadsides. Map 42.

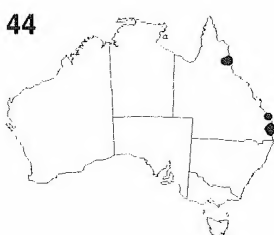
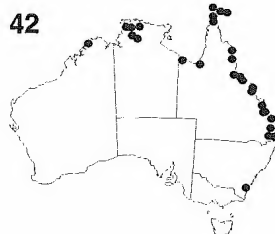
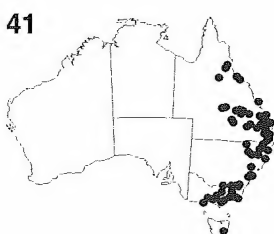
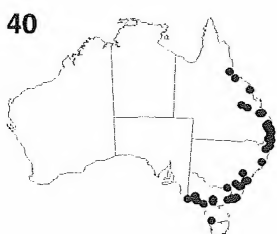
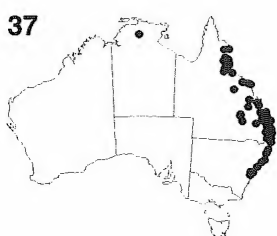
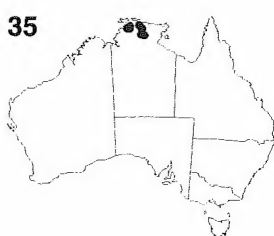
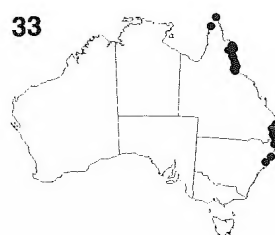
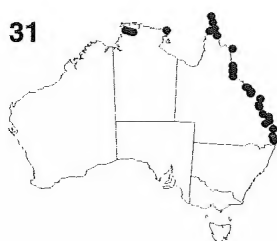
Affinities: Because of its twisted pods *D. tortuosum* is unlikely to be confused with any other species known from Australia, but it is closely related to the tropical American *D. procumbens* (Mill.) Hitchc. and the African *D. ospriostreblum* Chiov. which is probably only a variant of *D. procumbens*. The terminal article of the pods of *Clarkson* 3972 is about twice as large as the other articles, an attribute which allegedly distinguishes *D. ospriostreblum* from *D. procumbens* (Schubert 1971).

30. *Desmodium uncinatum* (Jacq.) DC., Prodr. 2:331 (1825); Schubert, *Field Mus. Nat. Hist. Bot.* 13(3):412 (1943); Fosberg, *Micronesica* 4:257 (1968), pro syn.; Verdcourt, *Man. New Guinea Leg.* 411 (1979); *Meibomia uncinata* (Jacq.) Kuntze, *Rev. Gen.* 1:197 (1891); *Hedysarum uncinatum* Jacq., *Pl. Hort. Schoenbr.* 3:27 t. 298 (1798). **Type:** 'Crescit in Caracas' (W?, n.v.).

Selected specimens: **Queensland.** WIDE BAY DISTRICT: 3 km NE of Kin Kin, 26°15'S 152°54'E, May 1976, *Jacobs* 2520 & *Rodd* (K, NSW); MORETON DISTRICT: cultivated CSIRO Experimental Farm, Samford, Apr 1960, (BRI, K). **New South Wales.** 4.6 miles [7.4 km] from Sheep Station sign on Lynch's Creek road, Wiangaree State Forest, 28°23'S 153°06'E, May 1973, *Tindale* 2114 (NSW).

Distribution and habitat: *Desmodium uncinatum* ("silver-leaf *Desmodium*") was deliberately introduced into Australia as a forage crop and has become naturalised in high rainfall areas of south-eastern Queensland and north-eastern New South Wales, usually on loamy volcanic soils. Map 43.

Affinities: Schubert, Fosberg and Ohashi (1990) commented on the confusion of the identities of *D. uncinatum*, *D. intortum* and *D. limense* Hook. Contrary to Fosberg's treatment of *D. uncinatum* as a synonym of *D. intortum*, Schubert's and Verdcourt's recognition of them as distinct species is reasonable. The differences given in the key hold for South American as well as Australian and New Guinea specimens. Ohashi (1990) applied the



31. *Desmodium heterocarpon*
var. *strigosum*

34. *Desmodium thviense*

37. *Desmodium rhytidophyllum*

40. *Desmodium gunnii*

43. *Desmodium uncinatum*

32. *Desmodium strigillosum*

35. *Desmodium velutinum*

38. *Desmodium tenax*

41. *Desmodium varians*

44. *Desmodium intortum*

33. *Desmodium nemorosum*

36. *Desmodium gangeticum*

39. *Desmodium macrocarpum*

42. *Desmodium tortuosum*

45. *Desmodium incanum*

name *D. sandwicense* to plants growing in Hawai'i. The correct name for the species (if it is different from *D. uncinatum*) is the earlier *D. pilosiusculum* DC.

- 31. *Desmodium intortum* (Mill.) Urban**, Symbol. Antill. 8:292 (1920); Schubert, Field Mus. Nat. Hist. Publ. Bot. 13(3):427 (1943); Verdcourt, Man. New Guinea Leg. 400 (1979); McVaugh, Fl. Novo-Galiciana 5:470 (1987); Ohashi, Man. Fl. Pl. Hawai'i 667 (1990); *Meibomia intorta* (Mill.) Blake, Bot. Gaz. 78:286 (1924); *Hedysarum intortum* Mill., Gard. Dict. ed. 8. no. 11 (1788). **Type:** Jamaica, *Houston* (?BM, n.v.)

Selected specimens: Queensland. MORETON DISTRICT: Nambour, Jan 1972, *Everist* [AQ 4279] (BRI, K); Brisbane Botanic Gardens, Dec 1975, *Verdcourt* s.n. (K). New South Wales. Wiangaree State Forest, 28°23'S 152°06'E, May 1973, *Tindale* 2116 (NSW).

Distribution and habitat: Like *D. uncinatum*, *D. intortum* ('green-leaf *Desmodium*') was introduced into Australia as a forage plant and has become naturalised, though not as frequently as *D. uncinatum*. Map 44.

Affinities: The affinities of the species are commented on under *D. uncinatum*.

- 32. *Desmodium incanum* DC.**, Prodr. 2:332 (1825); Benth. in Martius, Fl. Bras. 15:98 (1859) & synonyms cited; Nicolson, Taxon 27:365–370 (1978); McVaugh, Fl. Novo-Galiciana 5:468 (1987); Green, Fl. Austral. 49: 179 (1994); *Hedysarum incanum* Sw., Nov. gen. 107 (1788), *nom. illeg.* **Type:** Plumier (ed. Burman), Pl. Amer. 140 t. 149. f. 1. (1757) "*Hedysarum foliis ternatis, ovatis, floribus specatis*".

Desmodium frutescens Schindl., Rep. sp. nov. reg. veg. 21:9 (1925) & synonyms cited. **Type:** Jacq., Hort. Vindob. 3:47. t. 89 (1776) "*Hedysarum frutescens* Jacq. non L."

Desmodium canum Schinz & Thellung, Mem. Soc. Neuchatel. Sci. Nat. 5:371 (1913); Schubert, Fl. Trop. East Africa. Legum. Papilion. 456 (1974); Verdcourt, Man. New Guinea Leg. 394 (1979);

Hedysarum canum Gmel., Syst. Veg. 2:1125 (1792). **Type:** as for *D. incanum* DC.

Specimens: Queensland. MORETON DISTRICT: Indooroopilly, Brisbane 27°31'S 152°59'E, Mar 1994, *Pedley* 5678 (BRI); Scarborough, Redcliffe City, 27°12'S 153°07'E, May 1994, *Galagher* s.n. (BRI).

Distribution and habitat: This species is a native of tropical America, often used as a cover crop and naturalised in many countries. It occurs as a weed in a lawn at Indooroopilly and on a walk path at Redcliffe, both in the extreme south-east of Queensland. Prior to its collection in the field it had been grown experimentally under glass in the vicinity of Brisbane at least as early as 1964.

Affinities: The plant resembles *D. heterocarpon*, but has an open inflorescence and its leaves have more primary lateral veins. Its fused stipules distinguish it from other species. Map 45.

Note: Nicholson, in his detailed discussion of the complex nomenclature of *D. incanum* and *D. canum*, pointed out that both Bentham and Schindler considered *D. ancistrocarpum* (Ledebour) DC. (based on *Hedysarum ancistrocarpum* Ledebour) to belong to this species. In the interest of stability however, he refrained from reviving the earlier name. If *D. ancistrocarpum* is indeed conspecific with *D. incanum* it is to be expected in the interest of continuing stability that the name *D. ancistrocarpum* be rejected in favour of *D. incanum*.

Phyllodium Desv., J. Bot. Agric. 1:123. t. 5. f. 24 (1819); Benth. in Miq., Pl. Jungh. 217 (1852); Ohashi, Ginkgoana 1:260 (1973); *Dicerna* sect. *Phyllodium* (Desv.) Benth. in Benth. & J.D. Hook., Genera Pl. 1:519 (1865); *Desmodium* subg. *Phyllodium* (Desv.) Baker in J.D. Hook., Fl. Brit. India 2:162 (1876). **Type:** *Phyllodium pulchellum* (L.) Desv.

Phyllodium is a genus allied to *Dendrolobium*. In *Dendrolobium* flowers are arranged in fascicles or short (rarely long) racemes which are subtended by foliage leaves, whereas in *Phyllodium* fascicles of flowers are usually subtended and hidden by 'foliar bracts'. These

foliar bracts are modified foliage leaves: the terminal leaflet is lost or reduced to a terminal seta and the lateral leaflets are much reduced in size; stipules and stipels are retained. In other Desmodieae flowers are subtended by stipule-like bracts not at all like foliage leaves in colour, texture or shape.

Ohashi (1973) described subg. *Prainea* to accommodate *P. insigne* (Prain) Schindl. in which foliar bracts are only sporadically developed. In the field, plants of *P. hackeri* sp. nov. produce foliar bracts at the bases of inflorescences only, but plants grown under

glass (Hacker 389A, BRI) have foliar bracts at most nodes of the inflorescence. Thus, since the production of foliar bracts is largely controlled by environmental factors, their presence or absence is not a sound basis for the recognition of a subgenus. Consequently, subg. *Prainea* is ignored.

In Australia there are three species of *Phyllodium*; namely, *P. pulchellum* with an ill-defined variant described here as a variety, a well-defined species confined to northern Queensland (*P. hackeri*) and a third, known only from one specimen.

Key to species

1. Pedicel 7–12 mm long; flowers large: calyx c. 5 mm long, standard 10–10.5 mm long and 5–6 mm wide pods with up to 5 articles, each 5.5–7 × 5 mm **1. *P. hackeri***
- Pedicel to 3 mm long; flowers small: calyx to 3 mm long, standard to 7 mm long and 4 mm wide; pods with up to 3 articles, each 4 × 3.5 mm 2.
2. Foliar bracts subtending fascicles of flowers at anthesis; calyx with upper lobe narrowly ovate, lower lobe 1.5–2 mm long, longer than others ... **2. *P. pulchellum***
- Foliar bracts a few at base of inflorescence at anthesis; calyx with upper lobe broadly ovate, obtuse, lower lobe to c. 1 mm long, about as long as upper lobe **3. *P. sp.A***

1. *Phyllodium hackeri* Pedley, sp. nov. forsan affinis *P. insigne* (Prain) Schindler bracteis foliatis ± caducis praedito sed a quo foliolis infra non dense lanatis, interdum parvioribus differt, sed similis *P. pulchello* (L.) Desv. a quo bracteis foliatis ± caducis, pedicellis longioribus (7–12 mm), floribus grandioribus, articulis leguminis multo grandioribus differt: **Typus:** Queensland. COOK DISTRICT: between Irvinebank and Petford, c. 17°20'S 145°00'E, February 1980, J.R. Clarkson 2832A (holo:BRI; iso:K, MBA, PERTH, QRS).

Phyllodium sp. (Montalbion H.S. McKee 9430) Pedley in Henderson, Queensland Plants: Names & Distribution: 84 (1997).

Desmodium megaphyllum auct. non Zoll.; Knapp-van Meeuwen, Blumea 12:16 (1964).

Shrub to 1.5 m tall; branchlets angular with moderately dense appressed hairs 0.4 mm long.

Leaves 3-foliolate; stipules subulate, broad at the base, c. 5 mm long; petioles 12–30 mm long, rachis 15–25 mm long; leaflets ovate or elliptic, rounded at the base, obtuse or slightly retuse, mucronulate, sparse minute uncinulate hairs and appressed hairs on veins above, minute (c. 0.2 mm long) appressed hairs on lower surface; terminal leaflet 75–105 mm long, 30–50 mm wide, 2–2.5 times longer than wide; lateral leaflets smaller, 60–80 mm long, 30–40 mm wide; pulvinuses 2.3–2.8 mm long, stipels 1.5–2.2 mm long; foliar bracts (often absent) bifoliolate, the terminal leaflet reduced to a bristle, leaflets with indumentum of foliage leaves, petiole 3–6 mm long, petiolules c. 2.5 mm long, stipels c. 1.5 mm long; leaflets ovate, attaining 25 mm long, 15–20 mm wide. Flowers in fascicles of up to 16, in axillary or terminal racemes, each fascicle subtended by a foliage leaf or a foliar bract or without subtending leaf or foliar bract; bract c. 1 mm long; pedicels slender, appressed pubescent 7–12 mm long. Flowers: calyx 4.7–5.1 mm long, with minute

uncinate hairs and appressed white hairs c. 0.3 mm long, tube 2.2 mm long, upper and lower lobes 2.5–2.9 mm long, laterals about as long as the tube; corolla cream; standard oblong, obtuse or slightly retuse at apex, 10–10.5 mm long, 5–6 mm wide; wings 7.3–8.5 mm long, auriculate at base, with claw c. 2 mm long; keel petals auriculate, 8.5–9 mm long, 4–5 mm wide on claw 2.5–3 mm long; ovary sparsely pubescent. Pod with upper suture straight, lower somewhat indented, with up to 5 articles each 5.5–7 mm long, c. 5 mm wide, reticulately veined, glabrous except for appressed hairs on each suture; seed 3–3.7 mm × 2.5–3.2 mm with a small rim aril.

Specimens: **Queensland.** COOK DISTRICT: Lankelly Creek, McIlwraith Ra., 13°53'S 143°14'E, Jun 1992, *Forster* PIF 10365 & *Tucker* (BRI); Montalbion on Petford-Herberton road [17°24'S 145°09'E], Apr 1962, *McKee* 9430 (BRI, CANB); Irvinebank-Emuford, 17°25'S 145°00'E, Jan 1972, *Hyland* 5814 (BRI, QRS); cultivated from seeds collected on Chillagoe road, 17°25'S 145°04'E, Apr 1987, *Hacker* BH389A (BRI).

Distribution and habitat: *Phyllodium hackeri* has a limited distribution in northern Queensland where it occurs on sand and shallow rocky soil. Map 46.

Affinities: On account of its frequent lack of foliar bracts *P. hackeri* might be considered related to *P. insigne* or *P. pulchellum* var. *glabrius*. The relationship to other species is, however, not close and *P. hackeri* is rather isolated in the genus. Fascicles of flowers sometimes subtended by reduced foliage leaves in *P. hackeri* indicate that *Phyllodium* and *Dendrolobium* are closely related.

Etymology: The species is named to honour Dr J.B. Hacker, CSIRO, Brisbane who first brought the species to my attention. Plants grown in the glasshouse by Dr Hacker demonstrated that the production of foliar bracts by individual plants varied during its growing period.

2. *Phyllodium pulchellum* (L.) Desv., J. Bot. Agric. 1:124 t. 5. f. 24 (1813), Mem. Soc. Linn. Paris 4:324 (1825); Benth. in Miq., Pl. Jungh. 217 (1852); Schindl., Rep. sp. nov. reg. veg. 20:270 (1924); Ohashi, Ginkgoana 1:276 (1973); Pedley, Rev. Handb. Fl. Ceylon 10:165 (1996);

***Dicerma pulchellum* (L.) DC., Ann. Sci. Nat. 4:236 (1825), Prodr. 2:239 (1825), Mem. Leg. 328 (1826); *Desmodium pulchellum* (L.) Benth., Fl. Hongkong 83 (1961), Fl. Austr. 2:231 (1864); van Meeuwen, Reinwardtia 6:256 (1962); Liu & Chuang, Taiwania 8:89 t. 16 (1962); Verdcourt, Man. New Guinea Leg. 404 (1979); *Meibomia pulchella* (L.) Kuntze, Rev. Gen. 1:197 (1891); *Hedysarum pulchellum* L., Sp. Pl. 747 (1753). **Type:** Herb. Linn. No 921.24 (LINN, lectotype *vide* Pedley in Turland & Jarvis (1997).**

Two varieties are recognised in Australia.

2a. *Phyllodium pulchellum* (L.) Desv. var. *pulchellum*.

Foliar bracts always present, persisting until pods are produced; articles of pod glabrous or appressed pubescent on faces, appressed pubescent on sutures.

Specimens: **Northern Territory.** Keep River National Park, 15°48'S 129°05'E, Apr 1982, *King* 72 (DNA); Elcho Is., 11°57'S 135°43'E, Jul 1975, *Maconochie* 2115 (BRI, DNA, K). **Queensland.** COOK DISTRICT: Iron Range, 12°43'S 143°17'E, Jul 1988, *Hacker* JBH 892 (BRI); NORTH KENNEDY DISTRICT: 'Maidavale', E of Mingela, Apr 1991, *Bean* 2950 (BRI).

Distribution and habitat: *Phyllodium pulchellum* var. *pulchellum* occurs only sporadically in Australia and is nowhere common. In the Northern Territory it occurs on edge of coastal vine forests and in similar situations in Cape York Peninsula, but usually among boulders on hillslopes in eucalypt woodland in north-central Queensland. Map 47.

2b. *Phyllodium pulchellum* var. *glabrius*

Pedley var. nov., a *P. pulchello* var. *pulchello* bracteis foliatis in inflorescentiis tantum sporadice productis, articulis leguminis glabris vel pilis aliquot in suturis ornatis differt. **Typus: Northern Territory. Muldiva Creek, 14°01'S 130°43'E, February 1989, *C.R. Dunlop* 976 & *G. Leach* (holo: DNA; iso: BRI, K, MEL).**

Foliar bracts only sporadically produced, often absent on fruiting inflorescences; pod articles glabrous with a few hairs on sutures.

Specimens: NORTHERN TERRITORY: Upper East Alligator Region, 12°45'S 133°15'E, Apr 1988, *Russell-Smith* 5137 & *Lucas* (BRI, DNA, K, MEL); Leader Creek, Gunn Point, 12°12'S 131°06'E, Mar 1982, *Wightman* 226 (DNA).

Distribution and habitat: *Phyllodium pulchellum* var. *glabrius* occurs in the northern part of the Northern Territory in eucalypt communities, usually on sandy soils. The plant grows in a harsher environment than *P. pulchellum* var. *pulchellum* and the differences between the two may be due to the differences in habitat. Map 48.

3. *Phyllodium* sp. A

Shrub to 1 m; branchlets ribbed with moderately dense indumentum of matted white hairs 0.3 mm long. Leaves 3-foliolate; stipules subulate, to 6 mm long, c. 3 mm wide at the base; petioles 17 mm long, axis 20 mm long; leaflets ovate, rounded at the base, obtuse mucronulate, discolorous, sparse appressed hairs on upper surface, sparse curved hairs on lower, hairs 0.3 mm long; terminal leaflet 95–105 mm long, 50–55 mm wide, lateral leaflets smaller 55–70 mm long, 27–37 mm wide, about 10 lateral veins on each side of midrib all about twice as long as wide; foliar bracts present only at base of inflorescence, 2-foliolate, leaflets broadly ovate, truncate at apex, 7–9 mm long, 6–7 mm wide, sparsely hairy on both surfaces. Flowers in fascicles of up to 7 in axillary and terminal racemes up to 20 cm long; the rachis with indumentum similar to that of branchlets; primary bracts stipule-like to 2 mm long, pubescent at base and on margins; pedicels c. 3 mm long; bracteoles 0.6–0.8 mm long, 0.4 mm wide. Flowers: calyx c. 2.5 mm long with moderately dense appressed hairs; tube c. 1.5 mm long, upper and lower lobes c. 1 mm long, laterals c. 0.7 mm long; corolla cream; standard oblong or obovate, slightly retuse at apex, 6–7 mm long, c. 4 mm wide; wings 5.8–6 mm long, including claw 1.7–2 mm long, 1–1.2 mm wide, deeply auriculate; keel petals longer and wider than the wings, c. 7 mm long, including claw c. 2 mm long, c. 2.5 mm wide; ovary laterally compressed, glabrous on faces with fringe of hairs on margins, with 1–3, usually 2, ovules.

Specimen: Northern Territory. Adelaide River, c. 1 km downstream from Daly River road, Feb 1979, *Rankin* 1754 (BRI, DNA, K).

Distribution and habitat: The species is known from the single specimen cited. There is no information on its habitat. Map 49.

Affinities: *Phyllodium pulchellum* appears to be the nearest relative of the species. Because I know of the taxon from one specimen only, I have not formally described it.

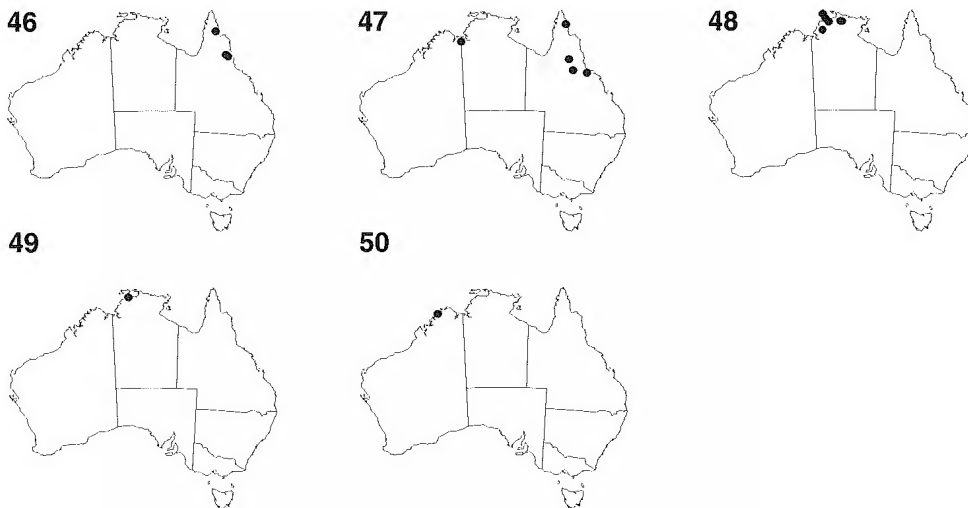
Tadehagi Ohashi, *Ginkgoana* 1:280 (1973) and synonyms cited; Pedley, *Rev. Hand. Fl. Ceylon* 10:168 (1996). **Type:** *Tadehagi triquetrum* (L.) Ohashi.

Tadehagi appears to be somewhat removed from *Desmodium* and immediately related genera but its relationship to *Droogsmansia* is close and requires further investigation.

Ohashi included three species in the genus each of which he referred to a different subgenus. He recorded *T. triquetrum* subsp. *triquetrum* from northern Australia and his distribution map indicates that it extends into south-eastern Queensland. He did not cite any specimen from Australia and the only one I have seen bears the label 'Tropical East Australia, *Evans*' (MEL). The record is a doubtful one. A species related to *T. triquetrum* does however occur.

Tadehagi robustum Pedley, **sp. nov.** a *T. triquetrum* (L.) Ohashi bracteolis brevibus et leguminibus plerumque articulis paucioribus instructis; a *T. triquetrum* subsp. *triquetrum* foliolis minus quam 3-flo longioribus quam latis, leguminis articulis grandioribus in suturis non nisi parce pubescentibus, a *T. triquetrum* subsp. *pseudotriquetrum* (DC.) Ohashi leguminibus grandioribus in suturis non nisi parce pubescentibus, a *T. triquetrum* subsp. *auriculato* (DC.) Ohashi leguminibus maturis neque suberosis neque glabris, a *T. triquetrum* subsp. *alato* (DC.) Ohashi leguminibus glabris differt. **Typus:** Western Australia. Mitchell Plateau (c. 1 km N of CRA mining camp), 14°49'S 125°40'E, January 1982, *B.R. Maslin* 5085 (holo: PERTH; iso: MEL, K).

Shrub to 1.2 m tall, sometimes branched from the base; branchlets strongly triquetrous, the angles ribbed, glabrous or with appressed hairs

46. *Phyllodium hackeri*47. *Phyllodium pulchellum*
var. *pulchellum*48. *Phyllodium pulchellum* var.
*glabrius*49. *Phyllodium* sp. A50. *Tadehagi robustum*

to 0.7 mm long on the ribs; stipules 20–25 mm long, 6–10 mm wide at the base. Leaves and petiolar wing discolorous, coriaceous, glabrous or with a few appressed hairs on major veins beneath; petiole 17–40 mm long, wing 2.5–6 mm wide on each side of petiole, widest in distal quarter; leaf blades oblong or ovate, acute at apex, rounded or auriculate at base, 55–135 mm long, 25–60 mm wide, 2–2.5 times longer than wide. Inflorescences terminal or in upper axils, to 35 cm long; fascicles usually 2-flowered; primary bracts 7–12 mm long decreasing in size along rachis; pedicels to 3.5 mm long; secondary bracts and bracteoles c. 1 mm long. Flowers: calyx with scattered stiff ± appressed white hairs and denser shorter hooked erect ones; tube 1.7 mm long, upper and lateral lobes c. 2.2 mm long, lower 2.7 mm long. Corolla dark pink or red; standard orbicular, 5 mm long, 6 mm wide, on stout claw 1.5 mm long; wings widest towards the tip, 4.5 mm long, 2.5 mm wide, auriculate at the base, on a claw 1.8 mm long; keel petals slightly shorter than the wings, 3.7 mm long, 2 mm wide, auriculate at the base, on a claw 2.3 mm long; ovary sparsely pubescent, moderately so on the margins. Pods sessile, of 4–5 articles, slightly indented on both sutures, the middle

articles c. 5 mm long, 8 mm wide, the proximal and distal ones longer. Seeds oblongoid, with a well developed rim aril, 3.6–3.7 mm long, 2.6–2.7 mm wide.

Other specimens (all Mitchell Plateau, all PERTH): May 1978, Kenneally 6814; Jun 1976, Kenneally 4946; Feb 1979, Beard 8327; Mar 1982, Keighery 4740.

Distribution and habitat: The plant is apparently restricted to the Mitchell Plateau of the Kimberley region of Western Australia where it occurs in woodland, sometimes in wetter areas, some seasonally flooded, and was reported by one collector to be common. Map 50.

Affinities: Though the taxon could be referred to *T. triquetrum* sensu lato it does not accord well with the subspecies recognised by Ohashi. It differs from subsp. *triquetrum* in having leaflets less than 3 times longer than wide and larger pod articles only sparsely hairy on sutures; from subsp. *pseudotriquetrum* in its larger pods only sparsely hairy on sutures; from subsp. *auriculatum* in its mature pods being neither corky nor glabrous; from subsp. *alatum* in its pods being not glabrous; and from all in its short bracteoles and pods usually with fewer articles.

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The work would have been sketchy indeed without the extensive collections of Mr Roy Pullen and I thank him for them and also for his annotations and notes on herbarium specimens which have been of great value. Ms Judy Wheeler (PERTH) drew my attention to *Alysicarpus cheelii* C.A. Gardner which I would surely have missed otherwise.

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***Boronia* sect. *Valvatae* (Benth.) Engl. (Rutaceae) in Queensland, Australia**

Marco F. Duretto

Summary

Duretto, Marco F. (1999). *Boronia* sect. *Valvatae* (Benth.) Engl. (Rutaceae) in Queensland, Australia. *Austrobaileya* 5(2): 263–298. A numerical analysis, using phenetic methods, was undertaken on the *Boronia rosmarinifolia* species complex. Four taxa were identified, three of which are new and are described here as *B. forsteri*, *B. splendida* and *B. palasepala*. Nine other new taxa belonging to *Boronia* sect. *Valvatae* (Benth.) Engl. (*B. bella*, *B. duiganiae*, *B. excelsa*, *B. foetida*, *B. hoipolloi*, *B. jensziae*, *B. odorata*, *B. quinkanensis* and *B. squamipetala*) are also described. All new taxa are confined to Queensland. A key to *Boronia* sect. *Valvatae* in Queensland is provided.

Keywords: *Boronia* sect. *Valvatae*, *Boronia*, Rutaceae, *Boronia bella*, *Boronia duiganiae*, *Boronia excelsa*, *Boronia foetida*, *Boronia forsteri*, *B. hoipolloi*, *Boronia jensziae*, *Boronia odorata*, *Boronia palasepala*, *Boronia quinkanensis*, *Boronia rosmarinifolia*, *Boronia splendida*, *Boronia squamipetala*.

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Introduction

As the 'Flora of Australia' account of *Boronia* Sm. sect. *Valvatae* (Benth.) Engl. was being prepared it became apparent that *B. rosmarinifolia* A.Cunn. ex Endl., as currently circumscribed, included a number of taxa. Endlicher (1837) described *B. rosmarinifolia* from material that was collected by Alan Cunningham from Peel's Island, Moreton Bay, Queensland (Fig. 1). *Boronia rosmarinifolia* is characterised by simple, sessile leaves that are hirsute abaxially, glabrous adaxially and have recurved to revolute margins. Specimens with these features occur in coastal areas from Bundaberg (Queensland) to Grafton (New South Wales) and inland to the Carnarvon Range area of Queensland (Fig. 1). In comparison with *B. rosmarinifolia* sensu stricto (coastal populations), plants previously included in *B. rosmarinifolia* from the Carnarvon Range and Robinson Gorge have smaller leaves and flowers; and those from the Monto and Dalby-Chinchilla–Haldon areas are taller and have larger leaves and flowers as noted by Lebler (1972). To ascertain whether these forms warrant taxonomic recognition a numerical

analysis, using phenetic methods, was undertaken.

An apparently undescribed taxon from the Pilliga Scrub (western slopes, New South Wales) has been known in the literature as *B. sp. aff. rosmarinifolia* B (Jacobs & Pickard 1981; Weston 1990; Weston & Porteners 1991). Though superficially similar to *B. rosmarinifolia*, it appears to be more closely related to *B. glabra* (Maiden & Betche) Cheel which is also found in the Pilliga Scrub (Duretto 1995, submitted), though it occupies a different local habitat (D. Mackay, NE, pers. comm.) The status of this form is being assessed by D. Mackay and will not be dealt with further in this paper.

There are a number of other Queensland *Boronia* taxa with simple leaves that have been assigned previously to *B. rosmarinifolia* or *B. sp. aff. B. rosmarinifolia* (e.g. in Stanley & Ross 1983). Most of these taxa have broad, flat, simple leaves (at least on older plants) and are quite distinct from *B. rosmarinifolia* and other *Boronia* species. These are described here as *B. bella* Duretto, *B. excelsa* Duretto, *B. foetida* Duretto, *B. jensziae* Duretto and *B. odorata* Duretto. To complete the revision of *Boronia* sect. *Valvatae* in Queensland, four pinnate leaved

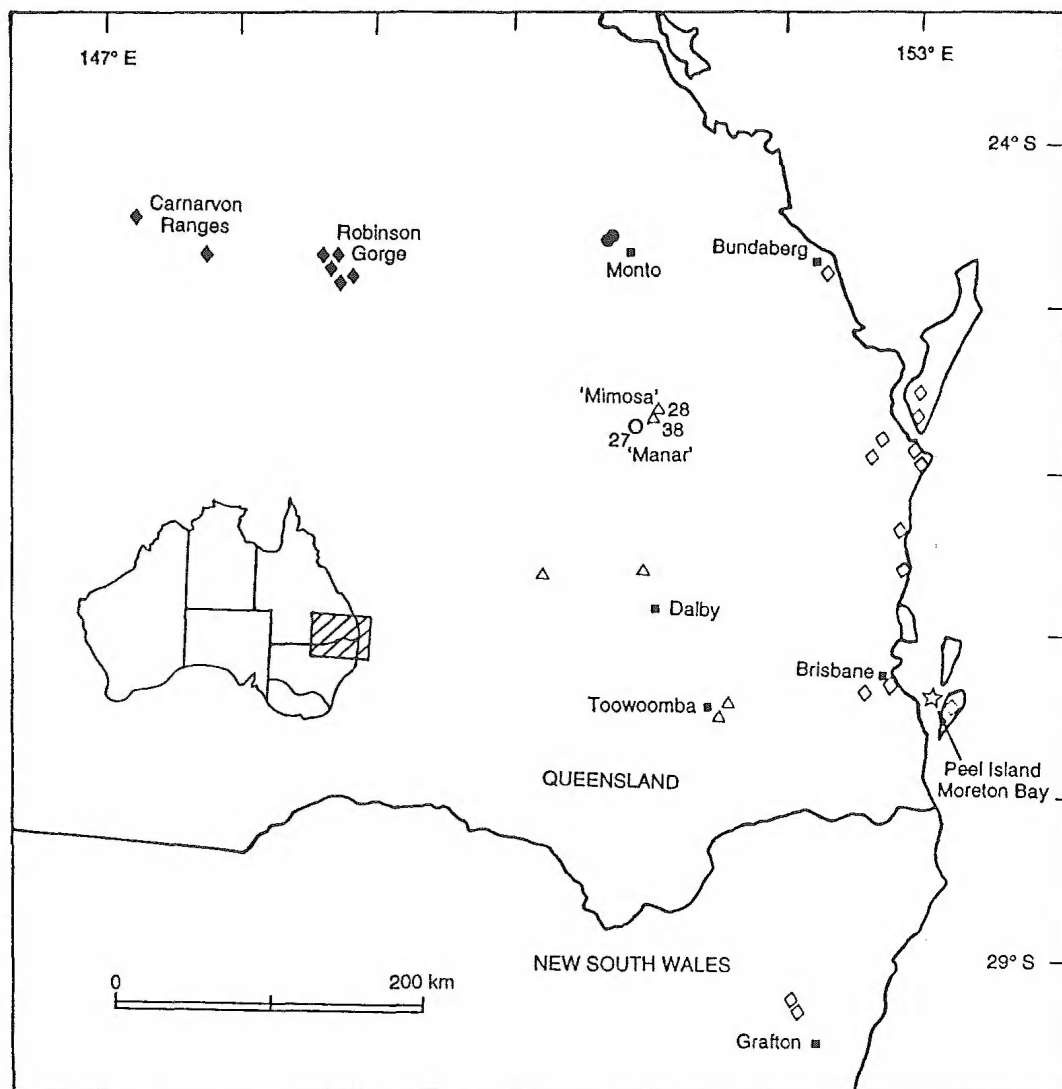


Fig. 1. Distribution of collection localities of specimens used in analysis of *Boronia rosmarinifolia* species complex (1–45); *Boronia rosmarinifolia* Group A (○); *B. forsteri* Group B (◆); *B. splendida* pro parte Group C (△); *B. palasepala* Group D (●); *B. splendida* pro parte Group E (○).

species (*B. duiganiae* Durretto, *B. hoipolloi* Durretto, *B. quinkanensis* Durretto and *B. squamipetala* Durretto) are also recognised and described here.

A specimen assignable to *B. ledifolia* (Vent.) DC. from the Pioneer River area of central Queensland (Pioneer River, Queensland, Dr Griffith, 1889 [MEL]) is the only collection of a *Boronia* species that has been made in the Mackay region seen by the author. *Boronia*

ledifolia, belonging in *Boronia* sect. *Valvatae*, is found in New South Wales and Victoria. The above specimen is therefore presumed to be mislabelled and may have been collected in Victoria where Dr Griffith had travelled (Durretto 1995, submitted), and this species is hence not dealt with further here. The taxon in southern Queensland called *B. ledifolia* by Neldner (1992), Ross (1994) and Forster (1997) is probably either *B. duiganiae* or *B. odorata*; the taxon in north-eastern Queensland

called by that name by Tension-Woods (1882) is probably a species of *Zieria* Sm. as it was ascribed very small flowers and trifoliolate leaves.

Materials and Methods

Material

Herbarium specimens from AD, BRI, CANB, DNA, MBA, MEL, MELU, NSW, PERTH, QRS and TCD were made available to the author. Herbarium abbreviations follow Holmgren et al. (1990). These specimens were augmented by material collected in the field. A list of all specimens examined is available from the author.

Anatomy

The central portion of the leaves of all taxa was sectioned transversely. Material to be sectioned was fixed in Mirsky's fixative (MAA) or 70% ethanol. If fresh material was not available, herbarium samples were re-hydrated by being placed in water with a small amount of detergent, brought to the brink of boiling, left simmering for one hour and soaked overnight before fixing in MAA. All fixed material was then placed in 70% ethanol overnight, dehydrated through a graded ethanol series up to 100% ethanol, infiltrated with 100% LR-White (London Resin) through a resin/ethanol series, and polymerised at 60°C. Sections 2 µm in thickness were cut on a Reichert Ultracut ultra-microtome, stained with 0.05% toluidine blue solution (pH 4.4) and observed and photographed using an Olympus BHS compound microscope. Anatomical features observed are described in the taxonomic descriptions below. Voucher specimens for leaf anatomy are listed in Appendix 1.

Scanning electron microscopy

Trichomes on leaves and petals, and seed surfaces were surveyed for all taxa (where material was available) using a scanning electron microscope. Dry leaves, petals and seeds were mounted on stubs using double sided or carbon tape with conductive carbon paint, coated with gold using an Edwards Sputter Coater S150B and examined and photographed at 5KV using a JEOL 840 Scanning Electron

Microscope equipped with a lanthanum hexaboride filament. All photographs of seeds were of central areas on a lateral side. Trichome and seed characters are described in the taxonomic descriptions below.

Phenetic Analysis of the *B. rosmarinifolia* species Complex

Characters

Eleven characters (Table 1) were scored for 45 herbarium specimens (Table 2) covering the geographic range of the *B. rosmarinifolia* species complex. Scores are an average of 10 measurements (where 10 organs were available) and ratios are the average of the individual ratios of the 10 organs measured. There are some problems associated with the use of ratios in phenetic analyses (see Duretto & Ladiges 1997 and references therein for discussion): here ratios are used as a means of quantifying and standardizing leaf and sepal shape (characters 4 and 7).

Table 1. Morphological characters used in the phenetic analysis of the *Boronia rosmarinifolia* species complex.

1	Style glabrous/hirsute, 0/1
2	Terminal leaf length (TLL) (mm)
3	Terminal leaf width (TLW) (mm)
4	TLW/TLL
5	Sepal length (SL) (mm)
6	Sepal width (SW) (mm)
7	SW/SL
8	Petal length (mm)
9	Petal width (mm)
10	Stellate hair rays on sepals <0.25 mm long/±0.5 mm long, 0/1
11	Anther appendage recurved/erect, 0/1

Table 2. Data used in the phenetic analysis of the *Boronia rosmarinifolia* species complex. Principal collector only given. For quantitative characters, mean values are given (see Table 1).

Specimen Number	Collector & number (or date)	Herbarium & sheet number	Character										
			1	2	3	4	5	6	7	8	9	10	11
1	Smith 7	MEL (MEL259152)	0	19.3	2.7	0.14	2.5	1.5	0.60	7.0	3.5	0	0
2	Ross 3196	MEL (MEL1552623)	0	15.7	1.9	0.12	2.5	2.0	0.80	6.5	3.5	0	0
3	Jobson 930	MEL (MEL221851)	0	18.6	1.8	0.10	3.0	2.5	0.83	6.0	3.0	0	0
4	Parish, 6.x.1982	MEL (MEL626024)	0	24.3	4.1	0.17	2.5	1.5	0.60	7.0	3.5	0	0
5	Walsh 1399	MEL (MEL1545124)	0	22.3	2.6	0.12	3.0	2.5	0.83	7.0	3.8	0	0
6	Baxter 1132	NSW (NSW243819)	0	19.8	2.1	0.10	3.0	2.0	0.67	6.0	3.3	0	0
7	Bird, 7.vii.1990	BRI (AQ472316)	0	18.7	2.5	0.13	4.0	2.5	0.63	6.0	3.5	0	0
8	Willis, 10.vii.1982	MEL (MEL628666)	0	19.5	1.7	0.09	4.0	2.5	0.63	7.0	3.3	0	0
9	Olsen 330	NSW (NSW243826)	0	16.1	1.7	0.10	2.5	1.5	0.60	6.0	3.0	0	0
10	McDonald 476	BRI (AQ117773)	0	19.0	2.0	0.11	3.0	2.0	0.67	6.5	2.7	0	0
11	White, 12.viii.1930	NSW (NSW243829)	0	16.6	1.8	0.12	3.0	2.0	0.67	6.5	3.0	0	0
12	Moriarty 415	CANB (CANB253236)	0	24.6	2.0	0.08	4.0	2.5	0.63	8.0	3.3	0	0
13	Duretto 259	MEL (MEL2036432)	0	12.8	2.2	0.17	2.0	1.5	0.75	6.0	4.0	0	0
14	Duretto 256	MEL (MEL2036427)	0	12.8	2.1	0.17	2.5	2.0	0.80	5.5	4.0	0	0
15	Duretto 254	MEL (MEL2036425)	0	14.8	2.9	0.20	2.5	2.0	0.80	6.0	4.0	0	0
16	Duretto 257	MEL (MEL2036428)	0	12.7	2.5	0.20	2.5	1.5	0.60	6.0	4.0	0	0
17	Duretto 258	MEL (MEL2036430)	0	21.6	4.1	0.19	3.0	2.0	0.67	6.5	4.0	0	0
18	Grieves, 22.vii.1979	NSW (NSW243816)	0	19.8	1.7	0.08	3.5	2.5	0.71	7.0	3.8	0	0
19	Foreman 907	MEL (MEL1539697)	0	19.5	2.4	0.12	4.0	2.0	0.50	8.0	4.0	0	0
20	Duretto 276	MEL (MEL2036609)	0	30.0	3.7	0.12	4.5	3.5	0.78	8.0	5.0	1	0
21	Duretto 277	MEL (MEL2036610)	0	26.0	2.9	0.11	4.0	2.5	0.63	8.5	4.5	1	?
22	Duretto 275	MEL (MEL2036608)	0	28.2	4.0	0.14	4.5	3.5	0.78	8.0	5.0	1	?
23	Duretto 279	MEL (MEL2036614)	0	30.0	3.5	0.12	3.5	2.5	0.71	8.0	5.0	1	?
24	Forster 6906	BRI (AQ472561)	0	30.9	4.7	0.16	5.0	4.0	0.80	10.0	6.0	1	?
25	Forster 6961	BRI (AQ472512)	0	30.2	4.3	0.15	5.0	4.0	0.80	9.0	5.5	1	0
26	Martensz 1014	CANB (CANB284160)	0	24.0	2.7	0.12	4.0	3.0	0.75	9.0	5.5	1	0
27	Forster 4647	BRI (AQ408650)	1	22.5	2.4	0.11	6.0	4.0	0.67	10.0	6.0	1	0
28	Forster 2243	BRI (AQ441712)	0	24.0	1.0	0.04	3.5	2.0	0.66	?	?	0	0
29	Forster 4762	MEL (MEL1575271)	0	35.6	2.0	0.06	3.0	2.0	0.67	10.0	6.0	0	0
30	Shoobridge, 29.ix.1964	BRI (AQ15118)	0	19.3	1.3	0.07	4.0	2.5	0.63	8.5	5.0	0	0
31	Williams 84159	BRI (AQ416779)	1	18.3	1.2	0.07	4.0	2.5	0.63	10.0	5.5	0	0
32	Smith 14102	BRI (AQ403268)	1	17.9	1.1	0.06	4.0	2.0	0.50	9.0	5.0	0	0
33	Duretto 337	MEL (MEL2036656)	1	18.1	1.9	0.11	4.0	3.0	0.75	8.5	5.0	0	0
34	Duretto 339	MEL (MEL2036657)	1	19.3	1.4	0.07	3.5	2.0	0.57	8.0	5.0	0	0
35	Duretto 338	MEL (MEL2044555)	1	19.8	1.3	0.07	3.5	2.0	0.57	8.5	5.0	0	0
36	Duretto 342	MEL (MEL2036660)	1	18.8	1.2	0.06	3.5	2.0	0.57	8.0	4.5	0	0
37	Shoobridge, 30.ix.1964	CANB (CBG15711)	0	28.2	1.9	0.07	4.5	3.0	0.67	10.0	6.5	0	0
38	Forster 11202	MEL (MEL 2049143)	1	25.9	2.1	0.08	4.5	3.0	0.67	11.0	6.0	0	0
39	Forster 11235	MEL (MEL 2049140)	0	15.1	2.6	0.17	3.0	1.5	0.50	5.5	2.0	0	1
40	Forster 11453	MEL (MEL 2049118)	0	19.1	3.1	0.16	2.5	1.5	0.60	5.0	2.0	0	1
41	Forster 11429	MEL (MEL 2049141)	0	15.7	2.7	0.18	2.5	1.5	0.60	5.0	2.5	0	1
42	Forster 11244	MEL (MEL 2049142)	0	17.2	2.7	0.16	2.5	1.5	0.60	4.5	2.0	0	1
43	Gittens 2745	BRI (AQ264152)	0	19.0	1.9	0.10	2.5	1.5	0.60	5.0	2.5	0	1
44	Thomas 138	CANB (CBG8900796)	0	12.4	2.6	0.21	2.0	1.0	0.50	5.5	2.5	0	1
45	Williams 86097	BRI (AQ406813)	0	12.0	2.1	0.18	2.0	1.0	0.50	4.0	1.8	0	1

Most characters are self explanatory but a few require clarification.

For characters 5 to 9, lengths, widths and ratios of perianth members proved difficult to measure accurately due to shrinkage of organs while drying, and their haphazard orientation on the herbarium sheet. Usually only a small number of these organs could be measured with any confidence on any herbarium specimen so measurements cited here should be treated as minimum values. Sepals and petals were measured on flowers without fruit as these organs enlarge during fruit development in most

members of *Boronia* sect. *Valvatae*.

For character 10, most specimens had multiangular stellate hairs with rays that were too small to measure confidently as they were much less than 0.25 mm long. Specimens 20 to 27, though, have hairs with rays that reach 0.5 mm in length. As there was no gradation between these states, this numerical character was scored as a binary character (Table 1).

Data Analysis

All data sets were analysed using PATN (Belbin 1987) following the methodology outlined in

Duretto & Ladiges (1997). Data were range standardised before Manhattan dissimilarity measures were calculated. For cluster analysis, both flexible UPGMA (unweighted pair group arithmetic averages) and flexible WPGMA (weighted pair group arithmetic averages) were utilised as fusion strategies. Data were ordinated in three dimensions using the multidimensional scaling, MDS, KYSP algorithm (Kruskal et al. 1973). The Hybrid option of Faith et al. (1987) was chosen. Twenty different random starting points were used for each analysis and the run with the lowest stress value is shown. Character correlations with the ordination vectors were calculated using the PCC function of PATN. Minimum spanning trees (MST) were also calculated.

Taxon descriptions

Descriptive terminology follows Theobald *et al.* (1979) and Hewson (1988) for hairs, Briggs & Johnson (1979) and Weston (1990) for inflorescence structure, and Murley (1951), Powell & Armstrong (1980) and Barthlott (1984) for seed surfaces. Conservation codes follow the format of Briggs & Leigh (1996).

Results

Analysis 1 (all specimens)

Analysis one was based on the entire data set (45 specimens x 10 characters; Table 2). Five groups, A to E, are recognisable in both the UPGMA (Fig. 2) and WPGMA (Fig. 3) classifications, in the ordination (Fig. 4 & 5) and in the MST (Fig. 6). Group A includes all coastal collections (specimens 1–19); Group B includes all specimens collected from Robinson Gorge and Carnarvon Ranges (specimens 39–45); Group C includes collections from the Dalby and Haldon areas (specimens 29–37), specimen 28 from near the 'Mimosa' Homestead and specimen 38 from near the 'Beeron' homestead; Group D includes all collections from Coomanglah State Forest (specimens 20–26); Group E is comprised of the single specimen 27 from near the 'Manar' Homestead (Fig. 1).

In the UPGMA classification (Fig. 2), Group A fuses first with Group C and then with

Group B, while in the WPGMA classification (Fig. 3), Group A fuses with Group B. In the MST (Fig. 6), Groups B, C and D connect to Group A at different places. Group E fuses with Group D in both classifications (Fig. 2 & 3). This larger group of D with E is the most dissimilar in the UPGMA (Fig. 2) but fuses with Group C in the WPGMA (Fig. 3). Group E is isolated but closer to Group D in the ordination (Fig. 4 & 5), but joins members of Group C in the MST (Fig. 6). Characters highly correlated with the vectors are 2, 5 and 6 for vector 1, 1, 3 and 4 for vector 2, and 7–9 for vector 3.

Analysis 2 (specimens 20–38, characters 1–7, 10)

For the five groups (A–E) recognised in Analysis 1, the relationships between Groups C, D and E (specimens 20–38) were ambiguous and so a data set containing specimens 20 to 38 and characters 1–7 and 10 was reanalysed. (Invariant characters in the data set were excluded from this analysis.)

Analysis 2 confirmed that Groups C, D and E of Analysis 1 (Fig. 2–6) are distinct. Group E fuses with Group D in both classifications (not shown). Though isolated in the ordination (Fig. 7, 8), Group E is closer to Group D (Fig. 8). In the MST (not shown) Group E is well within Group C, as was the case in Analysis 1 (Fig. 6). Characters highly correlated with the vectors are 3 and 4 for vector 1, 5 for vector 2, and 7 and 10 for vector 3.

Taxonomic interpretation

On the basis of the above analyses (Fig. 2–8), four taxa, corresponding to Groups A (specimens 1–19), B (specimens 39–45), C (specimens 28–38) and D (specimens 20–26), are recognised at the specific level. Results on the position of Group E (specimen 27) are conflicting. Geographically, the closest specimens to Group E are specimens 28 and 38 of Group C (Fig. 1) and in the MST (Fig. 6) specimen 27 links with specimen 38. Both these specimens have hirsute styles. As Groups C, D and E do not chain in the MST there is no evidence of a cline. Specimen 27 differs from members of Group C in having wider leaves and larger sepals, and from members of Group

D by having a hirsute style; a feature that is variable in Group C. Given this pattern of variation Group E is here considered to be conspecific with Group C.

The members of Group A are characterised by short hairs, recurved anther appendage and floral parts that are larger than those in members of Group B but smaller than those in members of Groups C/E and D (Table 3). The members of Group B are characterised by small floral parts, an erect anther appendage and short hairs. The members of Group C (including Group E) are characterised by the extremely narrow (usually recurved) leaves, large floral parts and short hairs. The members of Group D are characterised by wide leaves, comparatively large floral parts and long hairs.

Characters not used in these analyses that confirm these results include: members of Group B have hirsute fruit unlike the other groups (except for two specimens of Group A); and members of Group D have minute anther appendages unlike members of Groups B and C, this character being variable in members of Group A.

Coastal specimens (Group A) retain the name *B. rosmarinifolia* as the distribution of this group of specimens includes the type locality (Peel Island, Moreton Bay, Queensland) of that name and these specimens match the diagnosis given by Endlicher (1837) for this species. Groups B, C (including E) and D are here described as *B. forsteri* Durretto, *B. splendida* Durretto and *B. palasepala* Durretto respectively.

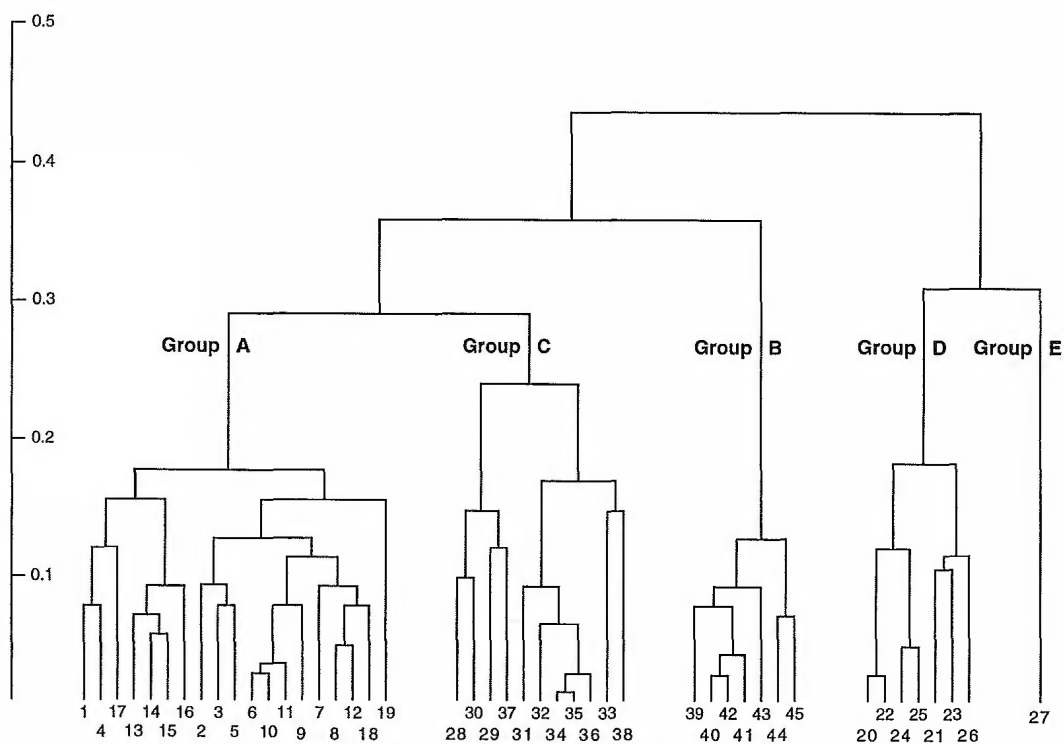


Fig. 2. Unweighted pair group arithmetic averages (UPGMA) classification, analysis one, all specimens.

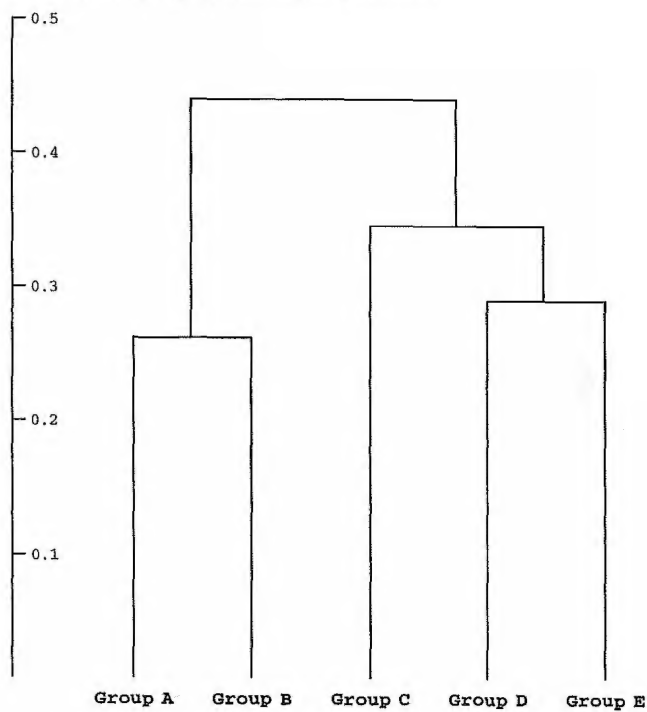


Fig. 3. Weighted pair group arithmetic averages (WPGMA) classification, analysis one, all specimens.

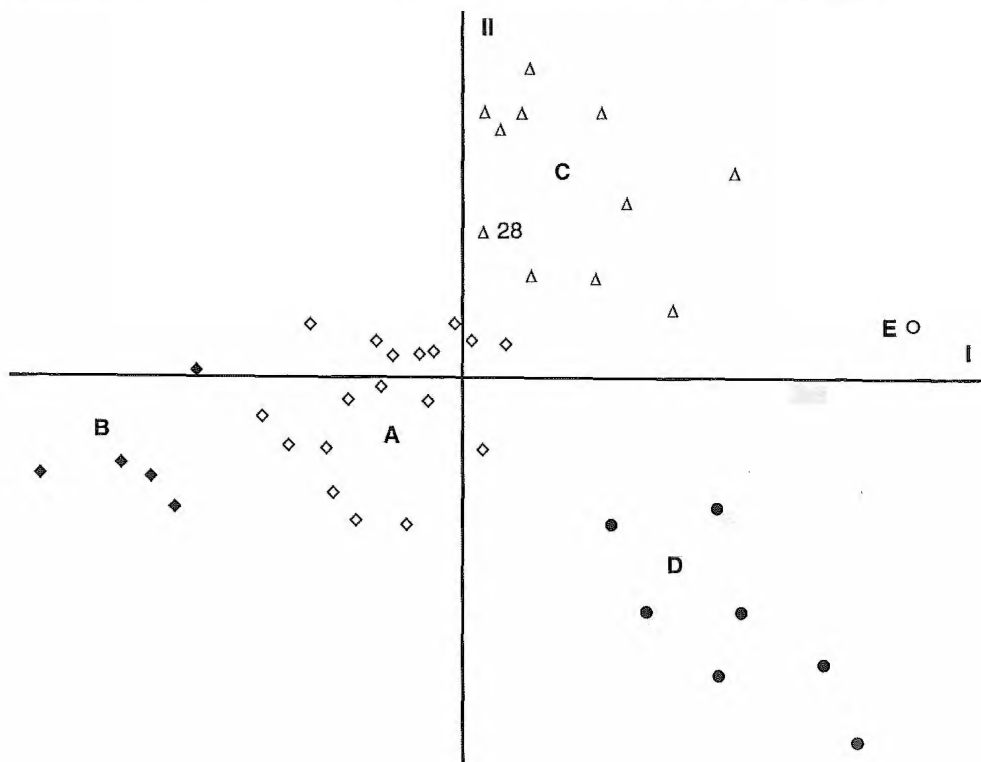


Fig. 4. Ordination (KYSP), vector 1 versus vector 2, analysis one, all specimens. *Boronia rosmarinifolia*, Group A (\diamond); *B. forsterii*, Group B (\blacklozenge); *B. splendida* (pro parte), Group C (\triangle); *B. palasepala*, Group D (\bullet); *B. splendida* (pro parte), Group E (\circ). Specimen 28, Group C numbered.

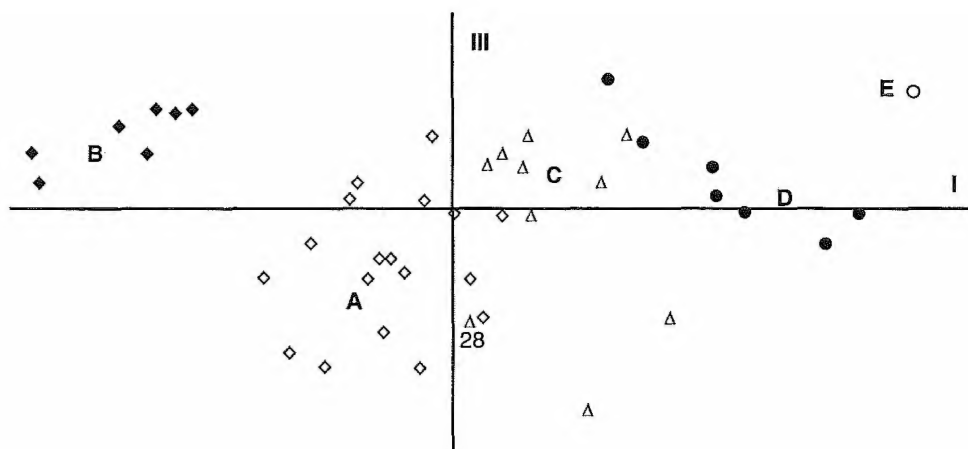


Fig. 5. Ordination (KYSP), vector 1 versus vector 3, analysis one, all specimens. Symbols are: *Boronia rosmarinifolia*, Group A (\diamond); *B. forsterii*, Group B (\blacklozenge); *B. splendida* (pro parte), Group C (\triangle); *B. palasepala*, Group D (\bullet); *B. splendida*, (pro parte) Group E (\circ). Specimen 28, Group C (numbered).

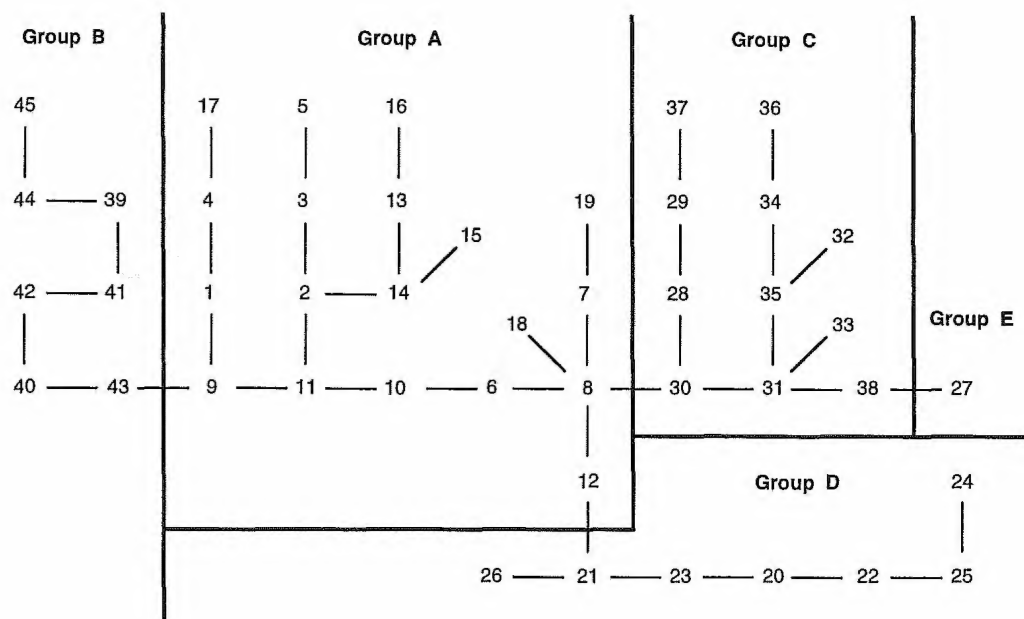


Fig. 6. Minimum spanning tree (MST), analysis one, all specimens.

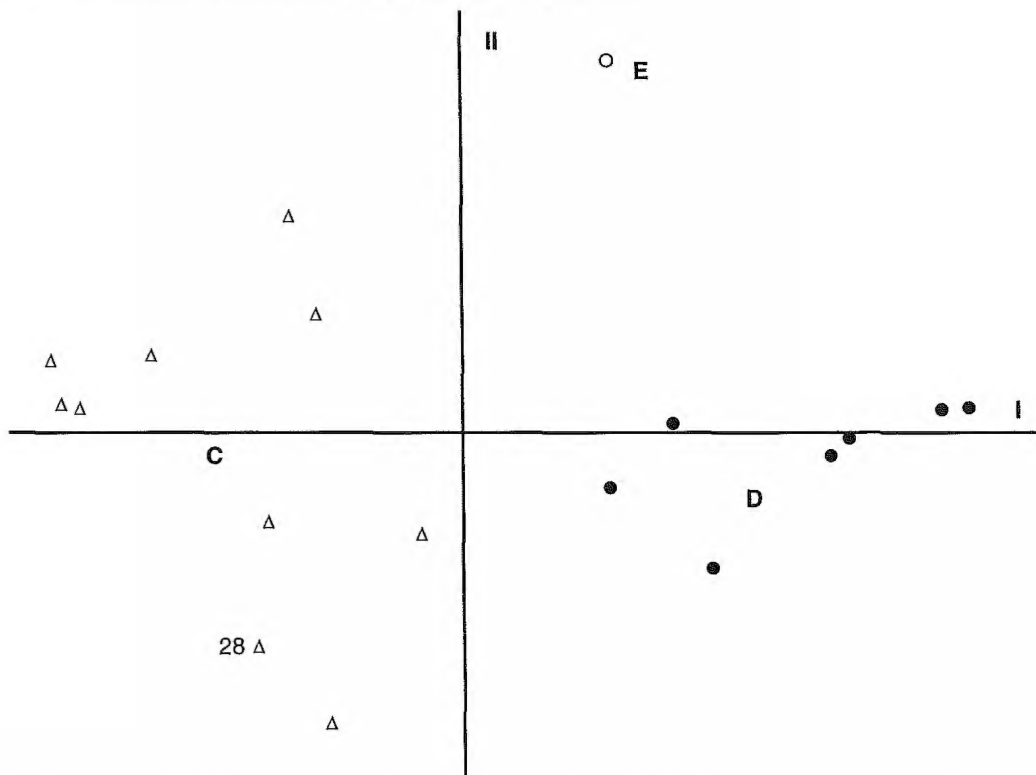


Fig. 7. Ordination (KYSP), vector 1 verses 2, analysis two, specimens 20–38. *Boronia splendida* (pro parte), Group C (Δ); *B. palasepala*, Group D (\bullet); *B. splendida* (pro parte), Group E (\circ). Specimen 28 Group C (numbered).

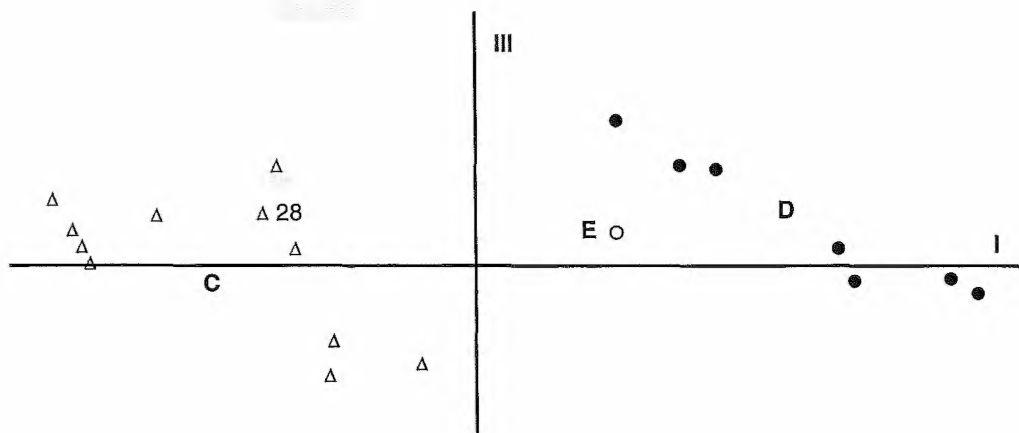


Fig. 8. Ordination (KYSP), vector 1 verses vector 3, analysis two, specimens 20–38. *Boronia splendida* (pro parte), Group C (Δ); *B. palasepala*, Group D (\bullet); *B. splendida* (pro parte), Group E (\circ). Specimen 28 Group C (numbered).

Table 3. Character ranges for Groups A, B, C, D and E, with means values given in brackets.

Character	Group A	Group B	Group C	Group D	Group E
1. Style glabrous /hirsute	0	0-1 (0.64)	0	0	1
2. Leaf length (LL) (mm)	12.7-24.6 (18.3)	17.9-35.6 (22.3)	1.6-3.1 (2.5)	24.0-4.7 (3.7)	22.5
3. Leaf width (LW) (mm)	1.7-4.1 (2.3)	1.0-2.1 (1.5)	1.9-3.1 (2.5)	2.7-4.7 (3.7)	2.4
4. LW/LL	0.08-0.20 (0.13)	0.04-0.11 (0.07)	0.10-0.21 (0.17)	0.11-0.16 (0.13)	0.11
5. Sepal length (SL) (mm)	2.0-4.0 (3.0)	3.0-4.5 (3.8)	2.0-3.0 (2.43)	3.5-5.0 (4.4)	6.0
6. Sepal width (SW) (mm)	1.5-2.5 (2.03)	2.0-3.0 (2.36)	1.0-1.5 (1.36)	2.5-4.0 (3.3)	4.0
7. SW/SL	0.50-0.83 (0.68)	0.50-0.75 (0.63)	0.50-0.60 (0.56)	0.63-0.80 (0.75)	0.67
8. Petal length (mm)	5.5-8.0 (6.6)	8.0-11.0 (9.2)	4.0-5.5 (4.9)	8.0-10.0 (8.6)	10.0
9. Petal width (mm)	2.67-4.00 (3.52)	4.5-6.5 (5.4)	1.8-2.5 (2.2)	4.5-6.0 (5.2)	6.0
10. Stellate hair rays on sepals < 0.25 mm long/c. 0.5mm long, 0/1	0	0	0	1	1
11. Anther appendage recurved/erect, 0/1	0	0	1	0	0

Taxonomy**Key to *Boronia* sect. *Valvatae* in Queensland**

1. Pinnate leaves present 2
All leaves simple 16
2. Stellate hairs, especially on petals, with fused rays and often appearing
peltate; abaxial surface of sepals glabrous (N Qld) 3
Stellate hairs with distinct rays; abaxial surface of sepals glabrous or with
a sparse to dense indumentum 4

3. Pinnae linear; branches obviously glandular; petals with a sparse indumentum abaxially **B. bowmanii**[#]
 Pinnae elliptic; branches not distinctly glandular; petals with a dense indumentum abaxially, scaly in appearance **13. B. squamipetala**
4. Adaxial and abaxial leaf surfaces with a dense indumentum (no epidermis visible) **5**
 Adaxial surface of leaves without a dense indumentum (epidermis clearly visible); abaxial leaf surface glabrous or with a sparse to dense indumentum **8**
5. Sepals much longer and wider than petals **B. lanuginosa**[#]
 Sepals much shorter than petals, or as long as but then much narrower than petals **6**
6. Sepals ovate, 1.5 to 2 times as long as wide, with acuminate tip (central Qld) **11. B. duiganiae**
 Sepals narrowly deltoid, at least 2.5 times as long as wide, with acute tip (NE & NW Qld) **7**
7. Pinnae linear to narrowly elliptic, c. 1 mm wide; sepals 2–3.5 mm long (NW Qld) **9. B. hoipolloi**
 Pinnae elliptic to oblanceolate, (1–)3–7 mm wide; sepals 3–5 mm long (NE Qld) **10. B. quinkanensis**
8. Leaves strongly discoloured with a dense indumentum on the abaxial surface (epidermis not visible) **9**
 Leaves slightly discoloured or concoloured, abaxial surface glabrous or with a sparse to moderate indumentum (epidermis clearly visible) **14**
9. Sepals narrowly deltoid, 2.5 times as long as wide, with tip acute **10**
 Sepals ovate, 1.5 to 2 times as long as wide, with tip acute or acuminate **12**
10. Leaves trifoliolate (Blackdown Tbl, Central Qld) **B. obovata**[#]
 Leaves 5–17-foliolate (N or SE Qld) **11**
11. Leaflets < 5 mm wide; petals 3–7 mm long, the adaxial surface with a dense indumentum; perianth often glabrous abaxially (N Qld) **B. alulata**[#]
 Widest leaflets > 5 mm wide; petals (6–)8–12 mm long, the adaxial surface with a sparse indumentum; perianth never glabrous abaxially (SE Qld) **B. amabilis**[#]
12. Leaves sometimes trifoliolate when juvenile but simple when mature, margins flat to slightly recurved; peduncle < 2 mm long; anthopodium 1–5 mm long; petals 5–7 mm long **12. B. odorata**
 Leaves imparipinnate, sometimes becoming simple with age, margins flat to revolute; peduncle (1–)2–10 mm long; anthopodium 7–11 mm long; petals (5–)8.5–12 mm long **13**
13. Sepals with tip acuminate, > 3.5 mm long, > 2 mm wide; adaxial surface of leaves with a sparse to dense indumentum **11. B. duiganiae**
 Sepals with tip acute, < 3 mm long, < 2 mm wide; adaxial surface of leaves glabrous or with a sparse indumentum **B. ledifolia**^{*}
14. Midrib raised on abaxial surface of leaves (Cooloola sand mass, SE Qld) **B. keysii**[#]
 Midrib not raised on abaxial surface of leaves (inland Qld) **15**

15. Branchlets not conspicuously glandular; leaves with sparse to moderate indumentum of hairs with flexuous rays, the hairs sometimes stalked (Granite Belt, SE Qld) **B. granitica**[#]
 Branchlets with large hemispherical glands; leaves glabrous or with a sparse indumentum of sessile hairs with straight rays (Central Highlands & Warang of N Qld) **B. eriantha**[#]
16. Mature leaves only slightly discoloured, glabrous or with a sparse to moderate indumentum on abaxial surface 17
 Mature leaves markedly discoloured with a dense indumentum (epidermis not visible) on abaxial surface (juvenile leaves not so) 19
17. Leaves petiolate **B. keysii**[#]
 Leaves sessile 18
18. Leaf margin glandular punctate; leaves with a sparse to moderate indumentum of stalked hairs with flexuous rays **B. repanda**[#]
 Leaf margin smooth, leaves glabrous or glabrescent; hairs sessile, rays straight **B. glabra**[#]
19. Leaves sessile, base not strongly attenuate 20
 Leaves petiolate or leaf base strongly attenuate 24
20. Petals (6–)8–13 mm long; sepals 2.5–6 mm long, (2–)3–4 mm wide 21
 Petals 4–7.5 mm long; sepals 2–4 mm long, 1–2 mm wide 22
21. Leaves strictly revolute, 1–2(–4 mm) wide; anther apiculum large and reflexed; stellate hairs with rays to 0.25 mm long **2. B. splendida**
 Leaves flat to recurved, sometimes revolute on drying, 2–6 mm wide; anther apiculum absent or minute; stellate hairs with rays to 0.5 mm long **3. B. palasepala**
22. Abaxial surface of petals glabrous or glabrescent; largest leaves greater than 35 mm long **6. B. excelsa**
 Abaxial surface of petals with a sparse to moderate simple indumentum; largest leaves usually less than 35 mm long 23
23. Fruit glabrous or with a sparse indumentum, very rarely densely hirsute; anther apiculum reflexed; stems terete to slightly quadrangular; sepals 2–4.5 mm long; petals 5–7.5 mm long (coastal and near coastal SE Qld and NSW) **1. B. rosmarinifolia**
 Fruit densely hirsute; anther apiculum erect; stems quadrangular; sepals 2–2.5 mm long; petals 4–6 mm long (central and inland Qld). **4. B. forsteri**
24. Stamen filaments glabrous or with 1 to 3 simple hairs; petals < 5.5 mm long (NW Qld, NT) **B. lanceolata** [#]
 Stamen filaments densely hirsute; petals (4.5–)5.5–12 mm long (NE & SE Qld) 25
25. Leaf adaxial surface with a sparse to moderate indumentum 26
 Leaf adaxial surface glabrous or with few hairs along midrib 27
26. Leaves elliptic, (2–)4–8 mm wide; peduncle 1–2 mm long; anthopodium 1–5 mm long (central inland Qld) **12. B. odorata**

- Leaves narrowly elliptic, 1.5–5 mm wide; peduncle 3–5 mm long;
anthopodium 4–8 mm long (central coastal Qld?, NSW, Vic.) **B. ledifolia***
27. Adaxial surface of petals with sparse to moderate indumentum of simple
hairs (Hinchinbrook Is. of N Qld) **5. B. jensziae**
Adaxial surface of petals glabrous or with very few simple hairs (Mt
Windsor Tbls of N Qld or SE Qld) **28**
28. Leaves narrowly elliptic, < 6 mm wide (Mt Windsor Tbls of N Qld) **6. B. excelsa**
Leaves elliptic, to 14 mm wide (SE Qld) **29**
29. Sepals 2–3.5 mm long (before fruit development); petals 6–8 mm long;
peduncles 2–3 mm long (Mt Walsh). **7. B. foetida**
Sepals 4.5–5 mm long (before fruit development); petals 9–10 mm long;
peduncles to 0.5 mm long (Many Peaks Ra.) **8. B. bella**

Currently accepted Queensland species that are not dealt with further here but discussed in detail in Duretto (1997, and/or submitted). *Boronia lanuginosa* Endl. has recently been collected from NW Qld (P.I. Forster pers. comm.)

* Species not found in Queensland but included in key as it is found very close to Queensland-New South Wales border (see Duretto submitted).

Boronia sect. *Valvatae* (Benth.) Engl., Nat. Pflanzen. 3(4), 135 (1896); *Boronia* ser. *Valvatae* Benth., Fl. Austral. 1: 308, 311 (1863). **Type:** type not cited (see below).

Qld 1: 37 (1979); L. Cronin, Concise Aust. Fl. 80 (1989); P.H. Weston & M. Porteners, Fl. NSW 2: 232 (1991); Fig. 9A–F.

Boronia sect. *Valvatae* has recently been revised (Duretto submitted) and is lectotypified therein. To avoid confusion and duplication in the species descriptions below a short description of this section is given here.

Inflorescence cymose, axillary. Sepals valvate, persistent with mature fruit. Petals valvate, with tip not inflexed, persistent with mature fruit. Stamens 8, all fertile; anthers glabrous. Stigma rounded, not or scarcely wider than style. Seed elliptical in outline with adaxial surface flattened.

- 1. *Boronia rosmarinifolia*** A. Cunn. ex Endl., Enum. Plant., Hügel: 16 (1837). **Type:** Queensland. MORETON DISTRICT: Peel's Island, Moreton Bay, in 1824, A. Cunningham (holo: W?, n.v.)

Boronia ledifolia var. *rosmarinifolia* (A. Cunn. ex Endl.) Benth., Fl. Austral. 1: 314 (1863).

Illustrations: B.A. Lebler, Qld Ag. J. 98: 196 (1972); K.A.W. Williams, Native Pl.

Erect or weakly ascending, much branched shrub to 1 m tall. Multiangular stellate hairs sessile, with 5–10 rays; rays unicellular, free, firm, straight, (0.05–)0.1 mm long, glossy, smooth, white to yellow. Branches terete to slightly quadrangular in TS, not glandular, with little or no cork development, with a moderate to dense stellate indumentum, becoming glabrous with age, will regrow from a rootstock; decurrent leaf bases absent. Leaves simple, not conspicuously glandular, sessile, elliptic to obovate, 6–30 mm long, 1–4.5 mm wide, with tip obtuse, strongly discolourous, paler beneath, lamina with palisade and spongy mesophyll; margins entire, recurved or flat; midrib raised slightly to prominent abaxially, with tightly packed parenchyma without secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface glabrous or with few hairs along midrib; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer (sometimes lacking from midrib) of peltate stellate hairs;

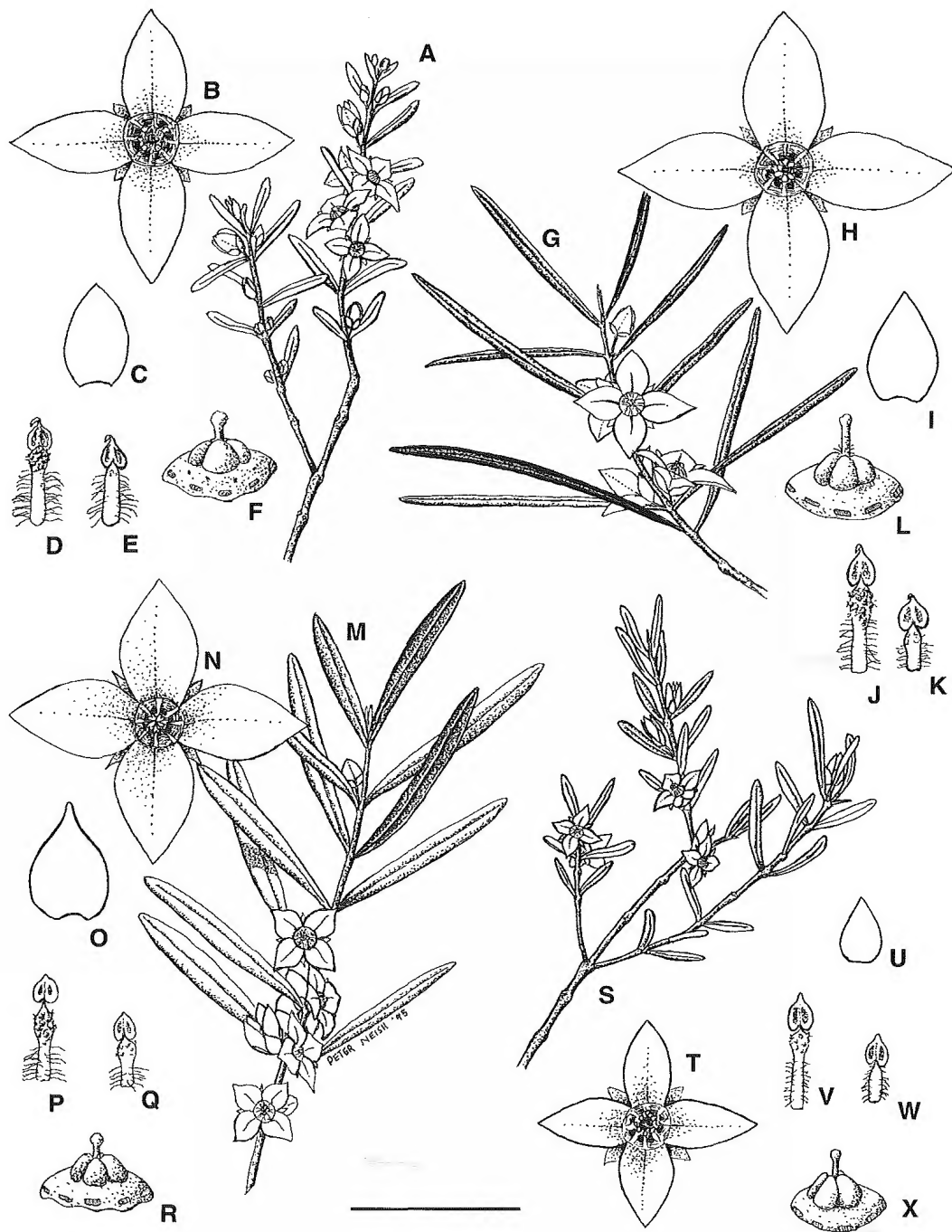


Fig. 9. A–F, *Boronia rosmarinifolia*. A, flowering branchlet; B, flower; C, sepal; D, abaxial view of antesepalous stamen; E, abaxial view of antepetalous stamen; F, disc and gynoecium. A–F, *Duretto 257* (MEL). G–L, *B. splendida*. G, flowering branchlet; H, flower; I, sepal; J, abaxial view of antesepalous stamen; K, abaxial view of antepetalous stamen; L, disc and gynoecium. G–L, *Duretto 337* (MEL). M–R, *B. palasepala*. M, flowering branchlet; N, flower; O, sepal; P, abaxial view of antesepalous stamen; Q, abaxial view of antepetalous stamen; R, disc and gynoecium. M–R, *Duretto 279* et al. (MEL). S–X, *B. forsteri*. S, flowering branchlet; T, flower; U, sepal; V, abaxial view of antesepalous stamen; W, abaxial view of antepetalous stamen; X, disc and gynoecium. S–X, *Forster 11235* (MEL). Scale bar: A, G, M, S = 24 mm; B, H, N, T = 10 mm; C, I, O, U = 6 mm; D–F, J–L, P–R, V–X = 4 mm. Del. Peter Neish.

juvenile leaves to 48 mm long and 10 mm wide, glabrous but becoming progressively more hirsute along shoot. Inflorescence 1(–3)-flowered, with a moderate to dense stellate indumentum; peduncle to 0.5 mm long, deciduous with flower; prophylls unifoliate, 1.5–2 mm long, to 0.5 mm wide; metaxyphylls to 0.5 mm long; anthopodium 1–6 mm long. Sepals (Fig. 9C) ovate-deltoid, 2–4 mm long, 1.5–2.5 mm wide, enlarging slightly with mature fruit, with tip acute; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink to white, 5–7.5 mm long, 3–4 mm wide, enlarging to 8–10 mm long and 6 mm wide with mature fruit, with midvein raised abaxially; adaxial surface sparsely to moderately simple pubescent; abaxial surface with a moderate to dense stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate, tapering to anther connective, c. 2 mm long, the distal 0.5–1 mm prominently glandular (Fig. 9D); antepetalous filaments c. 1.5 mm long, the distal end glandular (Fig. 9E). Anthers monomorphic or antepetalous anthers slightly larger before dehiscence; anther appendage large, reflexed, glabrous. Disc entire, not surrounding base of filaments, glabrous (Fig. 9F). Gynoecium glabrous (Fig. 9F). Coccus 4–5.5 mm long, 2.5–3.5 mm wide, glabrous or very rarely densely hirsute. Seeds black, shiny, 4–4.5 mm long, 2–2.5 mm wide, adaxial side without a ridge; elaiosome (placental portion of endocarp) yellow-white; surface at magnification as with *B. odorata*, Fig. 10A,B). *Rosemary Boronia*, *Forest Boronia* or *Possum Boronia*.

Additional selected specimens (c. 50 collections examined): Queensland. BURNETT DISTRICT: Curtis Rd, Kingaroy, 26°31'S 151°52'E, Sep 1996, *Bean* 10650 (MEL); WIDE BAY DISTRICT: W side of highway, Sunshine Beach, 2 miles S of Noosa, 26°26'S 153°04'E, Oct 1968, *Baxter & Lebler* 1132 (CANB, MEL, NSW); Rainbow Beach Rd towards Rainbow Beach, c. 300 m inside Cooloolo NP opposite sandstone hill, 26°01'S 153°00'E, Sep 1992, *Duretto* 258–60, *Bayly & Marsh* (258 - BRI, MEL, NSW; 259, 260 - MEL); Wide Bay, E side of Cooloolo Coast Rd, 49 km S of Maryborough, 25°56'S 152°51'E, Sep 1989, *Jobson* 930 & *Lum* (MEL); Cooloolo NP between Camp Milo & Freshwater Ck, 26°0–'S 153°0–'E, Jun 1970, *McDonald* 476 (BRI, CANB); Elliot R., near Bundaberg, May 1967, *Olsen* 330 (NSW); Fraser Is., Lake

Boemingen, 1 km S of lake along Dili Village walking tract, Oct 1982, *Parish* s.n. (MEL); 2.8 km S of Rainbow Beach, Cooloolo NP, 25°58'S 153°09'E, Sep 1986, *Ross* 3196 (AD, MEL); Fraser Is., between Lake Birrabreen & Lake Boemingen, 25°32'S 153°04'E, Aug 1971, *Smith* 7 (MEL); Fraser Is., southern half, 1.5 km W of Lake Boemingen camping area, 25°33'S 153°04'E, Aug 1984, *Walsh* 1399 (MEL); MORETON DISTRICT: Collingwood Park near Ipswich, 27°37'S 152°52'E, Jul 1990, *Bird* s.n. (BRI, CANB, MEL); Mt Tamborine, May 1930, *Cheel* s.n. (NSW); 4 km S of Sunshine Beach turnoff along coast Rd S of Noosa Heads, 100m along track heading W opposite car park, 26°28'S 153°06'E, Sep 1992, *Duretto* 253–7, *Bayly & Marsh* (253, 255 - MEL; 254, 257 - BRI, MEL; 256 - BRI, MEL, NSW); Miami, south coast, Sep 1965, *Jones* 3060 (CANB); North Stradbroke Is., c. 27°28'S 153°30'E, Aug 1970, *Moriarty* 415 (CANB); Moreton Is., Aug 1855, *Mueller* s.n. (MEL, TCD); Near Dunwich, North Stradbroke, Sep 1941, *Perry* s.n. (BRI); Sunnybank, 8 miles E of Brisbane, Aug 1930, *White & McKie* s.n. (NSW); Karawatha bushland, 1–1.5 km WNW of Trinder Park Railway Station, Woodridge, Jul 1982, *Willis* s.n. (MEL); **NEW SOUTH WALES.** NORTH COAST: Fortis Ck, 24 km N of Grafton on the road to Coaldale, Aug 1985, *Foreman* 907 (CANB, MEL); Property of Mr A. Ford at Whiteman Ck near Copmanhurst, Jul 1979, *Grieves* s.n. (NSW).

Typification: The type of *B. rosmarinifolia* has not been seen by the author but it should be in W where Endlicher worked. There is no confusion regarding application of this name however as *B. rosmarinifolia* is the only member of *Boronia* sect. *Valvatae* occurring in the Moreton Bay area of Queensland. The only other member of this section found close to the Moreton Bay area is *B. keysii* Domin (Cooloolo sand mass) which has pinnate or rarely simple, broad, flat, petiolate leaves with a sparse indumentum.

Taxonomy: Bentham (1863) reduced *B. rosmarinifolia* to varietal rank under *B. ledifolia* which was followed by Bailey (1899) in his *Queensland Flora* and later in his various catalogues of Queensland plants (e.g. Bailey 1913). Cheel (1928) reinstated *B. rosmarinifolia* to specific rank, which is the status accepted in this paper. Cheel (1928) also described *B. rosmarinifolia* var. *albiflora* Cheel. This variety was based on material of *B. ledifolia* s. str. and so is not discussed further here (see Duretto submitted).

Notes: Normally this species has glabrous fruit but two collections (*Baxter & Lebler* 1132 [BRI, NSW]; *Perry* s.n., Sep 1941 [BRI]) have

densely hirsute fruit as with fruits of *B. forsteri* and *B. glabra*. The presence of hirsute fruit in these two specimens of *B. rosmarinifolia* is not considered to be of any significant taxonomic importance. *Boronia rosmarinifolia* is distinguished from *B. forsteri* by its larger flowers and leaves, reflexed anther apiculum and usually glabrous fruits, from *B. splendida* and *B. palasepala* by its smaller flowers and leaves, and from *B. chartacea* P.H. Weston (North Coast, NSW) by its sessile leaves.

Distribution and ecology: Found in coastal and near coastal areas from Bundaberg, Wide Bay District, Queensland, to Grafton, North Coast, New South Wales (Fig. 1). Common in coastal heath (wallum) and woodland communities on well drained sand and sandstone derived soils. Flowering and fruiting material collected from May to December.

Conservation status: Common, widespread and found in several conservation reserves. Under no immediate threat except local extinction in and around Brisbane and the Gold Coast of Queensland.

Etymology: The specific epithet refers to the leaves that are similar to those of species of *Rosmarinus* L. (Lamiaceae).

2. *Boronia splendida* Duretto, sp. nov. a *Boronia rosmarinifolia* A.Cunn. ex Endl. foliis angustissimis revolutis, et floribus grandioribus (petalis 8–13 non 5–7.5 mm longis) differt. **Typus:** Queensland. MORETON DISTRICT: Falls Ck, 4 km NW of Haldon, Helidon 9342–084285, 27°45'S 152°04'E, 2 October 1988, *P.I. Forster* 4762 & *L.H. Bird* (holo: MEL [MEL 1575271]; iso: AD [AD 99120272], BISH (n.v.), BRI [AQ429500], CANB [CBG 8908090], K (n.v.), MO (n.v.) (Fig. 9G–L).

Erect, much branched shrub to 2.5 m tall. Multiangular stellate hairs sessile, with 5–10 rays; rays unicellular, free, firm, straight, to 0.05(–0.1) mm long, glossy, smooth, white to yellow. Branches slightly quadrangular in TS, not glandular, with little or no cork development, with a dense stellate indumentum, becoming glabrous with age; decurrent leaf bases absent. Leaves simple, not conspicuously glandular, sessile, linear to narrowly elliptic, 9–50 mm long, 1–2(–4) mm wide, with tip obtuse, base attenuate, strongly discolourous, paler beneath, lamina with palisade and spongy mesophyll; margins entire, strongly revolute;

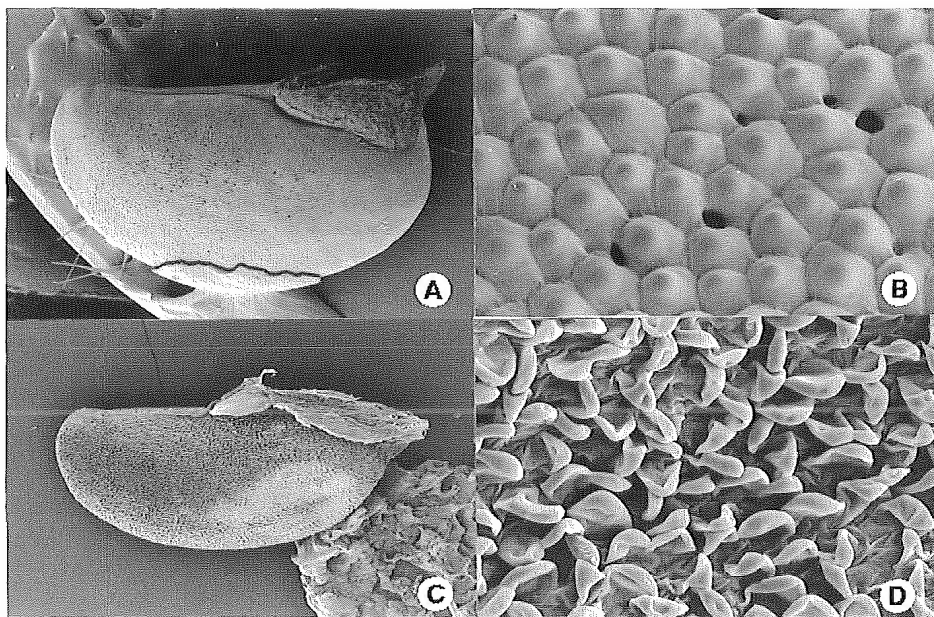


Fig. 10. Scanning electron micrographs of *Boronia* seed surfaces. A–B, *Boronia odorata*. Duretto 285 et al. (MEL); A x 14, B x 250). C–D *B. hoipolloi*. Clarkson 10473 (BRI); C x 19, D x 300.

midrib raised abaxially, with tightly packed parenchyma without secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface glabrous or with few hairs along midrib; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer (lacking or sparse cover on midrib) of peltate stellate hairs. Inflorescence 1(–3)-flowered, with a dense stellate indumentum; peduncle 0–0.5 mm long, deciduous with flower; prophylls unifoliate, 0.5–3 mm long, to 0.5 mm wide, with a dense stellate indumentum, or as leaves; metaxephylls to 0.5 mm long; anthopodium 2–6 mm long. Sepals (Fig. 9I) ovate-deltoid, 2.5–4(–6) mm long, 2–4 mm wide, enlarging slightly with mature fruit, with tip acute; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink to white, (6–)8–13 mm long, 4.5–6 mm wide, enlarging to 12–14 mm long and 6–7 mm wide with mature fruit, with midvein raised abaxially; adaxial surface moderately simple pubescent; abaxial surface with a moderate stellate indumentum. Stamen filaments clavate, tapering to anther connective, densely covered with stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments c. 1.5 mm long, the distal c. 0.5 mm prominently glandular (Fig. 9J); antepetalous filaments slightly tuberculate, c. 1 mm long (Fig. 9K). Anthers monomorphic; anther appendage large, reflexed, glabrous. Disc entire, not surrounding base of filaments, glabrous (Fig. 9L). Ovary glabrous (Fig. 9L). Style glabrous or hirsute. Coccus 5–6 mm long, 2.5–3 mm wide, glabrous. Seeds black, shiny, c. 4 mm long, c. 2 mm wide, with adaxial side without a ridge; elaiosome yellow-white; surface at magnification as with *B. odorata* (see Fig. 10A,B).

Additional specimens examined: Queensland. BURNETT DISTRICT: Stalworth Rd, north of Preston, 26°07'S 151°36'E, Sep 1996, *Bean* 10670 (MEL); Mundubbera, 9146–374346, 1.5 km W of 'Mimosa' Homestead, 25°54'S 151°23'E, Sep 1985, *Forster* 2243 (BRI); 8 km W of 'Manar', Homestead, Boondooma, 9145–303219, 26°01'S 151°18'E, Aug 1988, *Forster* 4647 (BRI, CANB); Beeron Holding, 5 km W of Toondahra Homestead, 25°58'S 151°20'E, Sep 1992, *Forster* 11202 & *Sharpe* (BRI, MEL); Beeron Holding, 25°59'S 151°20'E, Sep 1996, *Forster* 19603 & *Ryan* (MEL); DARLING DOWNS DISTRICT: 4.8 km E of Tara turn off, & 5.3 km E of Kogan on Condamine

Hwy, near dog fence, c. 27°02'S 150°46'E, Sep 1992, *Duretto* 337–344, *Bayly & Marsh* (337 - AD, BRI, CANB, MEL, NSW, PERTH; 338 - BRI, CANB, MEL; 339, 342–344 - MEL; 340 - BRI, CANB, MEL, NSW; 341 - BRI, MEL, NSW); Darling Downs, *Lace* s.n. (MEL); c. 2 miles E of Kogan, on the Condamine Hwy, Aug 1961, *Phillips* s.n. (CANB); Condamine Hwy, near dog fence, Sep 1964, *Shoobridge* s.n. (BRI [AQ15118], CANB, DNA); Dalby-Condamine, Sep 1964, *Shoobridge* s.n. (CANB [CBG15711]); 3 miles c. SE of Kogan, 27°02'S 150°46'E, Oct 1940, *Smith & Everist* 817 (MEL); c. 29 miles WNW of Dalby, near grid on the Condamine Hwy, 27°0–'S 150°4–'E, Sep 1968, *Smith* 14102 (BRI, DNA); Condamine, 26°56'S 150°08'E, Jul 1964, *Ward* s.n. (PERTH); On Condamine Hwy near rabbit fence, Oct 1984, *Williams* 84159 (BRI); MORETON DISTRICT: East Egypt, 25 km SW of Gatton, 27°40'S 152°07'E, Oct 1991, *Bird* s.n. (BRI, CANB); East Egypt, 16 km SW of Gatton, 27°40'S 152°07'E, Mar 1992, *Bird & Pahl* s.n. (BRI, CANB).

Notes: The tall inland form of *B. rosmarinifolia* referred to by Lebler (1972) probably is *B. splendida*. *Boronia splendida* is closely related to *B. forsteri*, *B. palasepala* and *B. rosmarinifolia* from which it can be distinguished by its tall stature, comparatively long and narrow leaves with revolute margins, and large flowers. A Proston specimen (*Bean* 10670) has smaller flowers and a smaller anther appendage than other collections but its strictly revolute, narrow leaves and small hairs identifies it as *B. splendida*. Further research and collections, preferably of several plants per population, of *B. splendida* are required in the northern part of its range to ascertain whether or not the specific distinction between *B. splendida* and *B. palasepala*, as described here, is warranted.

Distribution and ecology: Occurs in the Condamine-Kogan area, and north to 'Mimosa' homestead c. 50 km S of Mundubbera (Fig. 1). Found on sandstone derived soils in eucalypt and acacia woodland. Flowering material collected from March to November; fruiting material in November.

Conservation status: Though found over a wide area, collections of *B. splendida* are geographically isolated and populations at each site are small. This species is not known to occur in any reserves and a ROTAP code of 2R is therefore appropriate.

Etymology: The specific epithet is derived from Latin, *splendidus* (splendid, showy, striking), and refers to the spectacular display of comparatively large flowers by this species.

3. *Boronia palasepala* Duretto, sp. nov. a *Boronia rosmarinifolia* A.Cunn. ex Endl. sepalis majoribus ((3–)4–6 non 2–4 mm longis, 2–4 non 1.5–2.5 mm latis) ad apices acuminatis, petalis longioribus (8–10.5 non 5–7.5 mm longis), et antheris non-apiculatis differt. **Typus:** Queensland. BURNETT DISTRICT: Coomanglah State Forest 28, c. 24°51'30"S 150°56'E, Grid Ref. 9048–916493, 6 September 1992, *M.F. Duretto* 277, *M. Bayly* & *N. Marsh* (holo: MEL [MEL 2036610]; iso: AD, BRI, CANB, HO, K, MEL [MEL 2036611, MEL 2036612], NSW, PERTH) (Fig. 9M–R).

Erect, much branched, rounded shrub to 2 m tall. Multiangular stellate hairs sessile, with 5–10+ rays; rays unicellular, free, firm, straight, to 0.25(–0.5) mm long, glossy, smooth, white to yellow or red. Branches slightly quadrangular in TS, not glandular, with little or no cork development, with a moderate to dense stellate indumentum, becoming glabrous with age, branches will regrow from a rootstock; decurrent leaf bases absent. Leaves simple, not conspicuously glandular, sessile, elliptic to obovate, 14–42 mm long, 2–6 mm wide, with tip obtuse, base attenuate, strongly discolourous, paler beneath, lamina with palisade and spongy mesophyll; margins entire, flat to recurved (revolute on drying); midrib raised abaxially, with tightly packed parenchyma without secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface glabrous or with few hairs along midrib; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs. Inflorescence 1(–3)-flowered, with a moderate to dense stellate indumentum; peduncle to 0.5 mm long, deciduous with flower; prophylls unifoliate, 1–3 mm long, 0.5–1 mm wide, with a dense stellate indumentum, or as leaves; metaxiphylls minute, to 1.5 mm long; anthopodium 1–3(–5 mm in Biloela specimens) mm long. Sepals (Fig. 9O) broadly ovate-deltoid, (3–)4–6 mm long, (2–)3–4 mm wide, with tip acuminate to acute; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink to white, 8–10.5 mm long, 4.5–6 mm wide,

with midvein raised abaxially; adaxial surface moderately simple pubescent; abaxial surface with a moderate stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesepalous filaments clavate, tapering to anther connective, c. 2 mm long, the distal 0.5–1 mm prominently glandular (Fig. 9P); antepetalous filaments c. 1.5 mm long, the distal end glandular (Fig. 9Q). Anthers monomorphic; anther appendage absent or minute. Disc entire, not surrounding base of filaments, glabrous (Fig. 9R). Gynoecium glabrous (Fig. 9R). Fruit and seed not seen.

Additional specimens examined: Queensland. BURNETT DISTRICT: Coomanglah State Forest 28, c. 24°51.5' S 150°56'E, 9048–916493, Sep 1992, *Duretto* 275, 276, 278, 279, *Bayly* & *Marsh* (275 - BRI, CANB, MEL, NSW; 276 - BRI, K, MEL, NSW; 278 - AD, BRI, HO, NSW, MEL, PERTH; 279 - BRI, CANB, K, MEL, NSW); *ibid*, 24°51'S 150°57'E, 9048–914493, Jul 1990, *Forster* 6961 (BRI); *ibid*, 24°55'S 150°59'E, 9048–971425, Jul 1990, *Forster* 6906 (BRI, CANB, MEL, NSW); Coomanglah SF28, boundary between compartments 18 & 33, 14 km SW of Monto, 9048–KT982410, Aug 1976, *Martensz* 1014 (CANB); 15 km NE of Biloela, 3 km N of Callide dam, Jul 1992, *Thompson* BIL10 (AD, PERTH).

Notes: *Boronia palasepala* can be distinguished from the other members of the *B. rosmarinifolia* species complex by its comparatively large flowers, usually wide leaves with recurved margins (which can become revolute on drying) and spade-shaped sepals.

Distribution and ecology: Occurs near Biloela and in Coomanglah State Forest (SF28, near Monto), Queensland (Fig. 1). Found growing on sandstone in eucalypt open forest or woodland where it can dominate the understorey. Flowering material collected from July to September.

Conservation status: *Boronia palasepala* is known from few small populations outside existing conservation reserves; a ROTAP code of 2R is therefore appropriate.

Etymology: The specific epithet is derived from Latin *pala* (spade) and *sepala* (sepal), and alludes to the spade shaped (as of playing cards) sepals (Fig. 9O).

4. *Boronia forsteri* Duretto, sp. nov. a *Boronia rosmarinifolia* A.Cunn. ex Endl. petalis

et sepalis minoribus (2–2.5 non 2–4 mm longis) et coccis hirsutis differt. **Typus:** Queensland. LEICHHARDT DISTRICT: 7 km past Glenhaughton Homestead on Mapala Rd, SF46, 25°21'S 149°19'E, 10 September 1992, *P.I. Forster* 11235 & *P.R. Sharpe* (holo: MEL [MEL 2049140]; iso: BRI [AQ561403], NSW) (Fig. 9S–X).

Boronia sp. (Robinson Gorge P.I. Forster+ PIF11235) (Forster 1997).

Erect, much branched shrub to 1(–2) m tall. Multiangular stellate hairs sessile, with 5–10 rays; rays unicellular, free, firm, straight, to 0.1 mm long, glossy, smooth, white to yellow. Branches terete to slightly quadrangular in TS, not glandular, with little or no cork development, with a moderate to dense stellate indumentum, becoming glabrous with age; decurrent leaf bases absent. Leaves simple, not conspicuously glandular, sessile, elliptic to obovate, 6–25 mm long, 0.5–5 mm wide, with tip obtuse, base attenuate, strongly discolourous, paler beneath, lamina with palisade and spongy mesophyll (fresh material unavailable); margins entire, flat or slightly recurved; midrib raised slightly abaxially, with tightly packed parenchyma without secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface glabrous or with few hairs along midrib; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs; juvenile leaves to 35 mm long, abaxial surface glabrous or with a sparse indumentum. Inflorescence 1(–3)-flowered, with a moderate to dense stellate indumentum; peduncle to 0.5 mm long, deciduous with flower; prophylls unifoliate, 1.5–2.5 mm long, to 0.5 mm wide; metaxyphylls to 0.5 mm long; anthopodium 1.5–3 mm long. Sepals (Fig. 9U) ovate-deltoid, 2–2.5 mm long, 1–1.5 mm wide, enlarging slightly to 3 mm long with mature fruit, with tip acute; adaxial surface densely and minutely pubescent near margins, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink, 4–6 mm long, 2–3 mm wide, enlarging to 7–8 mm long and 5 mm wide with mature fruit, with midvein raised abaxially; adaxial surface

sparsely simple pubescent; abaxial surface with a moderate to dense stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate, tapering to anther connective, c. 1.5 mm long, the distal c. 0.5 mm prominently glandular (Fig. 9V); antepetalous filaments c. 1 mm long, the distal end glandular (Fig. 9W). Anthers monomorphic; anther appendage large, erect, glabrous. Disc entire, not surrounding base of filaments, glabrous (Fig. 9X). Gynoecium glabrous (Fig. 9X). Coccus 5–6 mm long, 2.5–3 mm wide, with a moderate to dense indumentum of erect, simple hairs. Seeds black, shiny, 4.5–5 mm long, 2–2.5 mm wide, with adaxial side without a ridge; elaiosome yellow-white; surface at magnification as with *B. odorata* (see Fig. 10A,B).

Additional specimens examined: Queensland. LEICHHARDT DISTRICT: Marlong Arch-Thombs area, 25°05'S 147°52'E, Sep 1978, *Benyon* s.n. (CANB); Gwambagwine, Ruined Castle Ck catchment, 25°13'08"S 149°27'02"E, Sep 1995, *Forster* 17836, *Figg & Carter* (MEL); Gwambagwine, Ruined Castle Ck catchment, 25°12'43"S 149°28'11"E, Sep 1995, *Forster* 17851, *Figg & Carter* (MEL); 5 km past Glenhaughton Homestead on Mapala Rd, SF46, 25°21'S 149°09'E, Apr 1992, *Forster* 9753 & *Manchin* (MEL); Robinson Gorge NP, northern end in headwaters of Glenhaughton Ck in Murphy Range, 25°12'S 149°07'E, Sep 1992, *Forster* 11429 & *Sharpe* (BRI, MEL); Robinson Gorge NP, near Starckvale Ck campsite, 25°18'S 149°11'E, Sep 1992, *Forster* 11244 & *Sharpe* (MEL); Get Down section, Robinson Gorge, Expedition NP, 25°18'08"S 149°11'23"E, Sep 1995, *Forster* 17696 & *Figg* (MEL); Starckvale Creek, Expedition NP, 25°18'34"S 149°10'53"E, Sep 1995, *Forster* 17714 & *Figg* (MEL); 11 km past Glenhaughton Homestead on Mapala Rd, 25°18'S 149°17'E, Sep 1992, *Forster* 11453 & *Sharpe* (BRI, MEL); 11.8 km N of 'Yoothapinna', Injune District, 25°15'S 148°20'E, Sep 1974, *Gittins* 2745 (BRI, NSW); 117.5 km S of Bauhinia Downs on Glenhaughton Rd, 25°17'20"S 149°16'52"E, Oct 1996, *Hill* 4863 (MEL, NSW); 21 miles SE of Bedourie, Oct 1963, *Speck* 1854 (BRI); 500m N of Robinson Gorge, c. 25 km NW of 'Glenhaughton' Homestead, 25°11'S 149°12'E, *Telford* 5635 (CANB); Mt Moffatt section of Carnarvon NP, behind Tombs Bluff, Sep 1986, *Thomas* 138 (CANB); Mt Moffatt 'The Tombs', Sep 1986, *Williams* 86097 (BRI).

Notes: *Boronia forsteri* can be distinguished from *B. rosmarinifolia*, *B. splendida* and *B. palasepala* by its smaller floral parts, erect anther apiculum and hirsute cocci. The

distributions of *B. forsteri* and *B. glabra* (a simple leaved species) may overlap in the Carnarvon Ranges (Duretto 1995, submitted). These two species both have hirsute cocci and the stamens and sepals of each are similar in size and shape. *Boronia forsteri* can be distinguished from *B. glabra* by having a dense indumentum on the abaxial surface of the leaves, as opposed to the glabrous leaves of *B. glabra* (at least in Queensland).

Distribution and ecology: Occurring on the Chesterton, Carnarvon and Expedition Ranges, and the Central Highlands of Queensland (Fig. 1). Found in dissected sandstone country in eucalypt open woodland or forest. Flowering and fruiting material collected in September and October.

Conservation status: *Boronia forsteri* occurs in Expedition Range and Carnarvon National Parks; a ROTAP conservation code of 2RC- is therefore appropriate.

Etymology: This species is named in honour of Paul Forster (BRI) whose prolific and untiring work, including collection of an impressive number of specimens for world-wide herbaria (often from remote and poorly collected areas), has increased our knowledge of the flora of Queensland and adjacent tropical areas considerably.

5. *Boronia jensziae* Duretto, sp. nov. a *Boronia rosmarinifolia* A.Cunn. ex Endl. foliis petiolatis, late ellipticis, et sepalis acuminatis, et a *B. bella* Duretto, *B. excelsa* Duretto et *B. foetida* Duretto indumento adaxiali petalorum sparso differt. **Typus:** Queensland. Cook DISTRICT: c. 300 m S of Banksia Bay turn off along the East Coast Trail between Little Ramsey & Zoe Bays, Hinchinbrook Is., 18°21.73'S 146°18.65'E, 29 May 1993, M. Duretto 406 (holo: MEL [MEL 2037448]; iso: AD, BRI, CANB, DNA, K, MEL [MEL 2037449], NSW) (Fig. 11A–F).

Boronia sp. 'Hinchinbrook Is.' (Thomas & McDonald 1989).

Boronia sp.1 (Hinchinbrook Island; S.L. Everist 7786) (Briggs & Leigh 1996).

Boronia sp. (Hinchinbrook Is. S.L. Everist 7786) (Forster 1997).

Illustration: K.A.W. Williams, Native Pl. Qld 2, 58 (1984) (as *Boronia* sp.)

Erect, much branched shrub to 2 m tall. Multiangular stellate hairs sessile, with 8–15 rays; rays unicellular, free, firm, straight, 0.05–0.1(–0.25) mm long, glossy, smooth, white to yellow. Branches terete to slightly quadrangular in TS, not glandular, with little or no cork development, with a dense stellate indumentum, becoming glabrous with age, will regrow from a rootstock; decurrent leaf bases absent. Leaves simple, not conspicuously glandular, subsessile to petiolate; petiole 2–4 mm long; lamina elliptic, (10–)15–45 mm long, (4–)6–11.5 mm wide, strongly discolourous, paler beneath, with palisade and spongy mesophyll, with tip acute and ± mucronate, with base strongly attenuate; margins entire, flat to slightly recurved; midrib prominently raised abaxially, with tightly packed parenchyma with secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface glabrous or with few hairs along midrib; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs. Inflorescence 1-flowered, with a dense stellate indumentum; peduncle 0.5–1 mm long, deciduous with flower; prophylls unifoliate, 2–2.5 mm long, 0.5–1 mm wide, with a dense stellate indumentum, or as leaves; metaxyphylls 0.5–1 mm long; anthopodium 2–5 mm long. Sepals (Fig. 11C) broadly ovate-deltoid, c. 4 mm long, c. 2.5 mm wide, not enlarging significantly with mature fruit, with tip acuminate; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink to white, 5.5–7 mm long, 3–3.5 mm wide, enlarging to 7.5–8.5 mm long with mature fruit, with midvein raised abaxially; adaxial surface with a sparse simple indumentum, becoming glabrous towards base; abaxial surface with a moderate to dense stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below

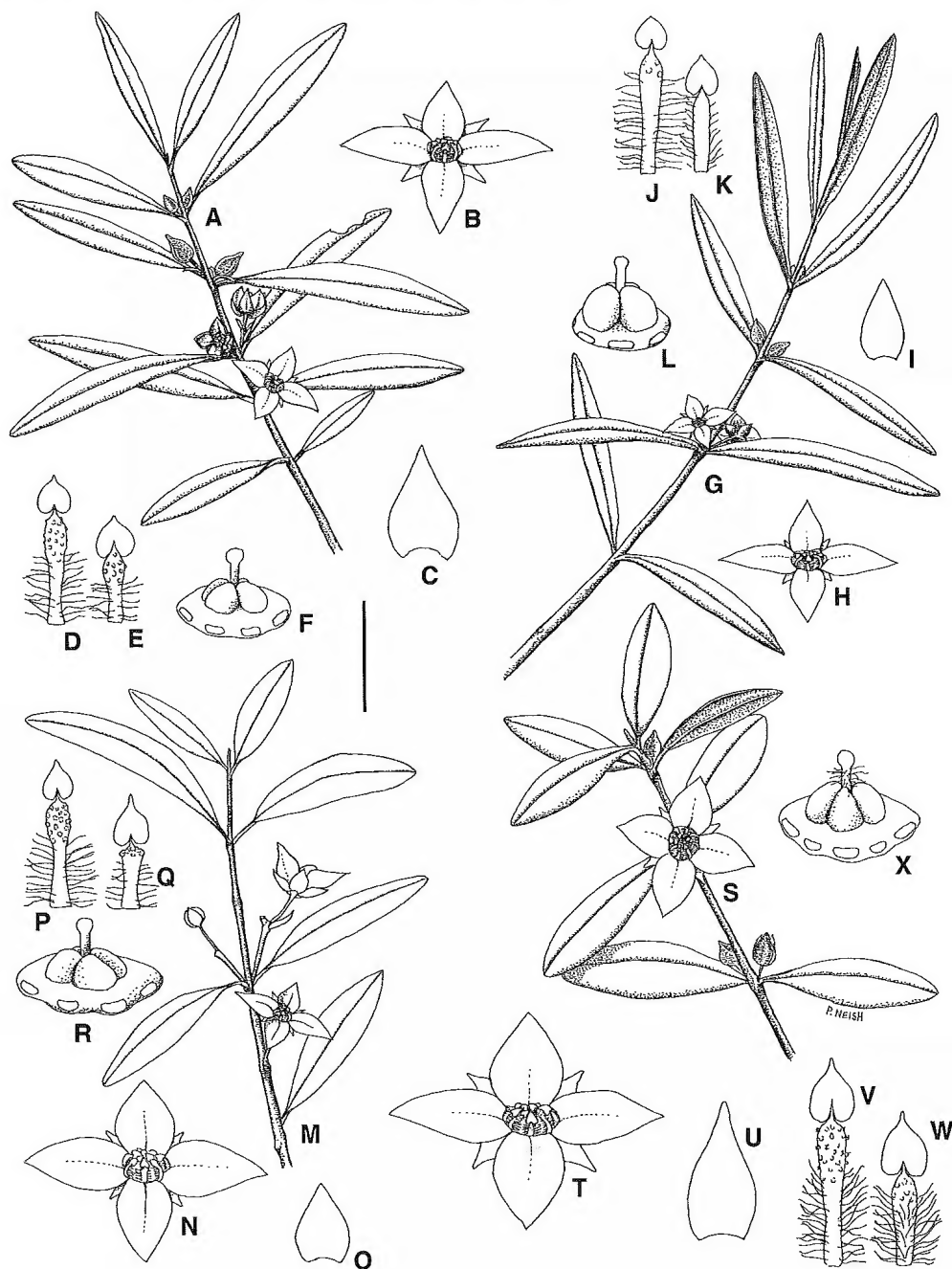


Fig. 11. A–F, *Boronia jensziae*. A, flowering branchlet; B, flower; C, sepal; D, abaxial view of antesepalous stamen; E, abaxial view of antepetalous stamen; F, disc and gynoecium. A–F, *Duretto* 406 (MEL). G–L, *B. excelsa*. G, flowering branchlet; H, flower; I, sepal; J, abaxial view of antesepalous stamen; K, abaxial view of antepetalous stamen; L, disc and gynoecium. G–L, *Forster* 17248 (MEL). M–R, *B. foetida*. M, flowering branchlet; N, flower; O, sepal; P, abaxial view of antesepalous stamen; Q, abaxial view of antepetalous stamen; R, disc and gynoecium. M, *Forster* 7483 (MEL); N–R, *Duretto* 263 (MEL). S–X, *B. bella*. S, flowering branchlet; T, flower; U, sepal; V, abaxial view of antesepalous stamen; W, abaxial view of antepetalous stamen; X, disc and gynoecium; S–X, *Duretto* 269 (MEL). Scale bar: A, G, M, S = 16 mm; B, H, N, T = 8 mm; C, I, O, U = 4 mm; D–F, J–L, P–R, V–X = 2 mm. Figure 11 was prepared by Peter Neish for inclusion in *Flora of Australia* vol. 26 (in prep.) and is reproduced here with the permission of the artist and ABRIS.

glandular tip; antesealous filaments clavate, tapering to anther connective, c. 2 mm long, the distal 0.5–1 mm prominently glandular (Fig. 11D); antepetalous filaments, c. 1.5 mm long, the distal end slightly glandular (Fig. 11E). Anthers monomorphic; anther appendage minute to large and reflexed, glabrous. Disc entire, not surrounding base of filaments, glabrous (Fig. 11F). Gynoecium glabrous (Fig. 11F). Coccus 4–4.5 mm long, 2–3.5 mm wide, glabrous. Seeds black, shiny, 2.5–3.5 mm long, 1.5–2 mm wide, with adaxial side without a ridge; elaiosome yellow-white; surface at magnification as with *B. odorata* (see Fig. 10A,B). *Andy Jensz's Boronia, Hinchinbrook Boronia*.

Additional specimens examined: Queensland. NORTH KENNEDY DISTRICT: Zoe Bay, Hinchinbrook Is., Aug 1951, *Blake* 18857 (BRI, CANB); Mt Diamantina, 18°26'S 146°18'E, Jul 1991, *Cumming* 11273 (BRI); Mount Bowen, Hinchinbrook Is., 18°41'S 146°16'E, Jun 1991, *Cumming* 11217 (BRI); c. 300 m S of Banksia Bay turn off along the East Coast Trail between Little Ramsey & Zoe Bays, Hinchinbrook Is., 18°21.73'S 146°18.65'E, May 1993, *Duretto* 405 & 407 (405 - AD, BRI, MEL, PERTH; 407 - BRI, CANB, MEL, NSW); On the East Coast Trail between Banksia & Zoe Bays, Hinchinbrook Is., 18°21.86'S 146°18.74'E, May 1993, *Duretto* 402 & *Vadala* (BRI, CANB, MEL, NSW, PERTH); *ibid*, 18°22.17'S 146°18.86'E, May 1993, *Duretto* 404 & *Vadala* (BRI, MEL); Southern end of Missionary Bay, N end of Hinchinbrook Is., 18°27'S 146°12'E, Feb 1965, *Everist* 7786 (BRI, CANB, MELU, NSW); Hinchinbrook Is., southern end of Missionary Bay, 18°19'S 146°13'E, Jun 1979, *Thornsbome* & *Thornsbome* 535 (BRI); Zoe Bay, Hinchinbrook Is., Sep 1967, *Thornsbome* s.n. (BRI).

Notes: *Boronia jensziae* is closely related to *B. excelsa*, *B. bella* and *B. foetida* from which it can be distinguished by having a sparse indumentum of simple hairs on the adaxial surface of the petals rather than being glabrous to glabrescent.

Distribution and ecology: Restricted to Hinchinbrook Island, north-eastern Queensland (Fig. 12). A poorly collected species found in a variety of habitats including *Syncarpia* Ten. or eucalypt open forest and montane heath, from sea level to c. 840 m (summit of Mt Bowman). Flowering material collected between February and September; fruiting material in August and September.

Conservation status: Briggs & Leigh (1996) gave a ROTAP code of 2KC- to this taxon but a ROTAP code of 2RC+ seems more

appropriate. Present collections and field observations by the author indicate that though *B. jensziae* does appear to be widespread on the eastern half of Hinchinbrook Island the populations are small and often near hiking trails. Further field research is required to ascertain the range of this species and to study the effect of the tourism on the size of the known populations.

Etymology: This species is named for Andrea Suzan Jensz, for her support and invaluable help to the author throughout the *Boronia* section *Valvatae* project.

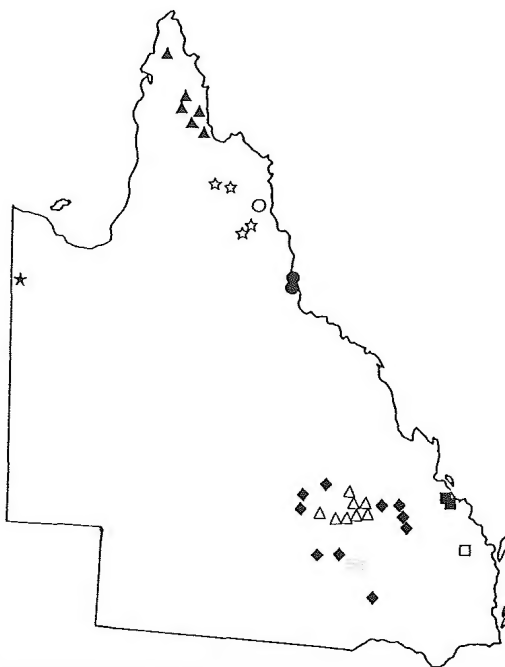


Fig. 12. Distribution of *Boronia bella* (■), *B. duiganiae* (△), *B. excelsa* (○), *B. foetida* (□), *B. jensziae* (●), *B. odorata* (◆), *B. hoipolloi* (★), *B. quinkanensis* (☆) and *B. squamipetala* (▲).

6. *Boronia excelsa* Duretto, sp. nov. a *Boronia rosmarinifolia* A.Cunn. ex Endl. sepalis acuminatis, et a *B. bella* Duretto, *B. foetida* Duretto et *B. jensziae* Duretto foliis sessilibus anguste ellipticis differt. **Typus:** Queensland. COOK DISTRICT: State Forest 144, Mt Windsor Tableland, 16°15'52"S 145°02'28"E, 11 July 1995, *P.I. Forster* 17248 & *S.J. Figg* (holo: BRI; iso: AD, BRI [×2], CANB, DNA, K, L, MEL [MEL 243038, MEL 249902,

MEL 249903, MEL 2025931], MO, NSW, PERTH, QRS (Fig. 11G–L).

Boronia sp. (Mt Windsor Tableland P.I. Forster+ PIF15225) (Forster 1997).

Erect, much branched shrub to 3 m tall. Multiangular stellate hairs sessile, with 8–20+ rays; rays unicellular, free, firm, straight, 0.05–0.1 (–0.25) mm long, glossy, smooth, white to yellow. Branches terete, not glandular, with little or no cork development, with a dense stellate indumentum, becoming glabrous with age; decurrent leaf bases absent. Leaves simple, not conspicuously glandular, sessile, narrowly elliptic, 14–60 mm long, 2–6 mm wide, with tip acute, base attenuate, strongly discolourous, paler beneath, lamina with palisade and spongy mesophyll (fresh material not seen); margins entire, flat to slightly recurved; midrib prominently raised abaxially, with tightly packed parenchyma with secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface glabrous or with few hairs along midrib; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs. Inflorescence 1-flowered, with a dense stellate indumentum; peduncle c. 0.5 mm long, deciduous with flower; prophylls unifoliolate, 1.5–2.5 mm long, 0.5–1 mm wide, with a dense stellate indumentum, or as leaves; metaxyphylls 0.5–1 mm long; anthopodium 2–4 mm long. Sepals (Fig. 11I) broadly ovate-deltoid, 3 mm long, 1.5 mm wide, with tip acuminate to acute; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink to white, 4.5–5 mm long, 2–3 mm wide, with midvein raised abaxially; adaxial surface glabrous or glabrescent; abaxial surface with a moderate stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate, tapering to anther connective, c. 1.5 mm long, the distal c. 0.5 mm prominently glandular (Fig. 11J); antepetalous filaments c. 1 mm long, the distal end slightly glandular (Fig. 11K). Anthers monomorphic, apiculum absent. Disc entire, not surrounding base of filaments, glabrous (Fig. 11L). Gynoecium glabrous (Fig. 11L). Coccus c. 4.5 mm long, c. 2 mm wide,

glabrous. Seeds black, shiny, 3–3.5 mm long, c. 1.5 mm wide, adaxial side without a ridge; elaiosome yellow-white; surface at magnification as with *B. odorata* (see Fig. 10A,B).

Additional specimens examined: Queensland. COOK DISTRICT: State Forest 144 Mt Windsor Tableland, 16°15'52"S 145°02'28"E, Jul 1995, *Forster* 17253 & *Figg* (BRI, MEL); Spencers Creek, downstream about 2 km from Forestry Camp, Mt Windsor Tableland, Whypalla SF, 16°15'S 145°7'E, Aug 1988, *Hind* 56791 & *D'Aubert* (NSW); SFR144 (Mt Windsor Tableland), 16°15'S 145°00'E, Jun 1969, *Hyland* 4784 (BRI, QRS).

Notes: *Boronia excelsa* is closely related to *B. jensziae*, *B. bella* and *B. foetida* from which it can be distinguished by its narrow, sessile leaves and smaller flowers.

Distribution and ecology: Restricted to the Mount Windsor Tableland, north-eastern Queensland (Fig. 12). Found growing on granite-derived soils in wet sclerophyll and *Syncarpia* forests and along rainforest margins. All collections have been made above 1000 m in altitude.

Conservation status: As the only known collections of *B. excelsa* are from a limited area within a logging reserve (SFR144) a ROTAP conservation code of 2R is appropriate. The type collection was made from a population of c. 40 plants (Forster pers. comm.)

Etymology: The specific epithet is derived from the Latin, *excelsus* (high or elevated), and refers to the comparatively high altitudes where this species occurs.

7. *Boronia foetida* Duretto, sp. nov. a *Boronia rosmarinifolia* A.Cunn. ex Endl. foliis petiolatis, late ellipticis, et sepalis acuminatis, a *B. bella* Duretto floribus minoribus (sepalis 2–3.5 non 4.5–5.5 mm longis, petalis 7–8 non 7–12 mm longis) et stylis glabris, a *B. jensziae* Duretto petalis adaxialiter glabris et a *B. excelsa* Duretto foliis petiolatis differt. **Typus:** Queensland. WIDE BAY DISTRICT: Mt Walsh, 7 km south of Biggenden, Grid Ref. 9347–046709, 25°34'S 152°03'E, 28 September 1990, *P.I. Forster* 7483 (holo: MEL [MEL 1597019]; iso: AD [AD 99135181], BRI [AQ474340], CANB [CANB 406384], K (n.v.), NSW, PERTH (n.v.) (Fig. 11M–R).

Boronia sp. (Mt Walsh P.I. Forster+ PIF17253) (Forster 1997).

Erect, much branched shrub to 2 m tall. Multiangular stellate hairs sessile, with 8–20+ rays; rays unicellular, free, firm, straight, 0.05–0.1(–0.25) mm long, glossy, smooth, white to yellow (Fig. 13A). Branches terete to slightly quadrangular in TS, not glandular, with little or no cork development, with a dense stellate indumentum, becoming glabrous with age, will regrow from a rootstock; decurrent leaf bases absent. Leaves simple, subsessile to petiolate; petiole 2–7 mm long; lamina not conspicuously glandular, elliptic to slightly lanceolate, 20–52

mm long, 7–14 mm wide, strongly discolourous, paler beneath, with palisade and spongy mesophyll, with tip acute, with base attenuate; margins entire, flat to slightly recurved; midrib prominently raised abaxially, with tightly packed parenchyma with secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface glabrous or with few hairs along midrib; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs (Fig. 13A). Inflorescence 1(–3)-flowered, with a dense stellate indumentum; peduncle 2–2.5 mm long, deciduous with flower or rarely persistent;

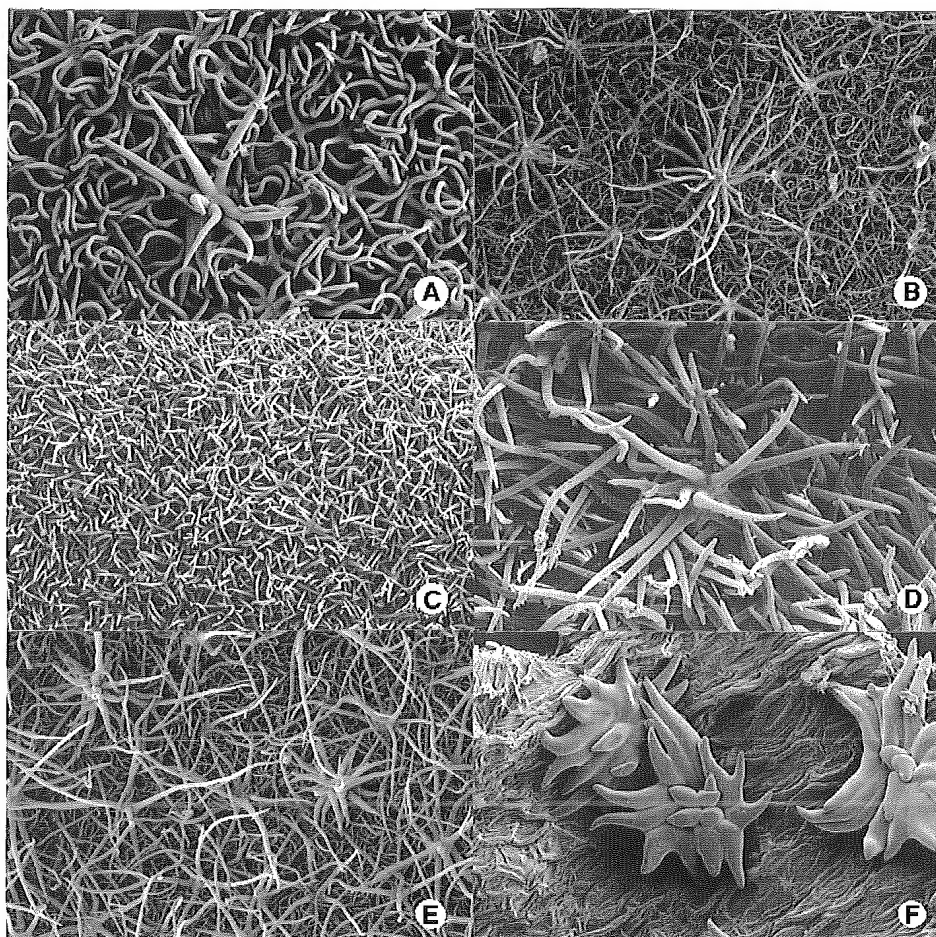


Fig. 13. Multiangular stellate hairs of *Boronia* species; abaxial leaf surface (A, B, D, E), adaxial leaf surface (C), or abaxial petal surface (F). A, *Boronia foetida*, $\times 180$. Bean 28 (BRI). B, *B. bella*, $\times 55$. Duretto 269 et al. (MEL). C–D, *B. quinkanensis*, C $\times 55$, D $\times 170$. Clarkson 6914 (MEL). E, *B. duiganiae*, $\times 55$. Duretto 315 et al. (MEL). F, *B. squamipetala*, $\times 200$. Moreton 631 (BRI).

prophylls unifoliolate, 1–6 mm long, 0.5–2 mm wide, with a dense stellate indumentum, or as leaves; metaxyphylls 0.5–1 mm long; anthopodium 7–13 mm long. Sepals (Fig. 11O) broadly ovate-deltoid, 2–3.5 mm long, 1.5–2.5 mm wide, enlarging to 4 mm long and 3 mm wide with mature fruit, with tip acuminate; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink to white, c. 7 mm long, c. 4 mm wide, enlarging to 8 mm long with mature fruit, with midvein raised abaxially; adaxial surface glabrous or glabrescent; abaxial surface with a moderate to dense stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate, tapering to anther connective, c. 2 mm long, the distal 0.5–1 mm prominently glandular (Fig. 11P); antepetalous filaments c. 1.5 mm long, the distal end slightly glandular (Fig. 11Q). Anthers monomorphic; anther appendage large, reflexed, glabrous. Disc entire, not surrounding base of filaments, glabrous (Fig. 11R). Gynoecium glabrous (Fig. 11R). Coccus 4–5 mm long, 2–3.5 mm wide, glabrous. Seeds black, shiny, c. 4 mm long, c. 2 mm wide, adaxial side without a ridge; elaiosome yellow-white; surface at magnification as with *B. odorata* (see Fig. 10A,B).

Additional specimens examined: Queensland. WIDE BAY DISTRICT: Mt Walsh near Biggenden, 25°3–'S 151°5–'E, Jun 1983, *Bean* 28 (BRI); Gully just below saddle between Mt Walsh & The Bluff, Mt Walsh NP, 25°34'S 152°03'E, Sep 1992, *Duretto* 261–265, *Bayly* & *Marsh* (261–MEL; 262–MEL, NSW; 263–BRI, MEL; 264–HO, MEL; 265–CANB, MEL); Mt Walsh NP, c. 15 km SW of Biggenden, Sep 1973, *Randell* s.n. (BRI); 13 km S of Biggenden, 25°3–'S 152°0–'E, Jun 1979, *Rayner* s.n. (BRI); Mt Walsh, c. 6.5 km S of Biggenden, 25°34'S 152°02'E, May 1977, *Telford* 5316 (BRI, CANB).

Notes: *Boronia foetida* was referred to as the Mt Walsh form of *B. rosmarinifolia* by Stanley and Ross (1983). Leaves of *B. foetida* show some variation in size. Specimens collected in montane heath communities have smaller leaves than those of specimens collected in the forest communities in gullies at lower altitudes. This phenomenon is common in *Boronia* species and is considered not to be of any taxonomic significance. *Boronia foetida* is closely related to *B. bella* from which it can be distinguished by its smaller flowers, smaller

hairs (Fig. 13A,B), and glabrous styles. It can be distinguished from *B. jensziae* by its petals being glabrous adaxially and from *B. excelsa* by its much wider leaves.

Distribution and ecology: Restricted to Mount Walsh, south of Biggenden (Fig. 12). Found in a variety of habitats ranging from montane heath to densely forested gullies. Flowering and fruiting material collected from May to September.

Conservation status: A ROTAP conservation code of 2RC+ is appropriate as the species is confined to Mt Walsh National Park.

Etymology: The specific epithet is derived from Latin *foetidus* (stinking), and alludes to the foul smelling foliage of this species (much more so than that of other members of *Boronia* sect. *Valvatae*). Some collectors have noted the smell as 'reminiscent of dead possum', but to me the leaves smell like an unpleasant combination of burnt styrofoam, tar and a very mature cheese.

8. *Boronia bella* Duretto, sp. nov. a *Boronia rosmarinifolia* A.Cunn. ex Endl. foliis petiolatis, ellipticus late, et sepalis acuminatis, et a *B. jensziae* Duretto, *B. excelsa* Duretto et *B. foetida* Duretto floribus grandioribus (sepalis 4.5–5.5 mm longis, petalis 7–12 mm longis) et stylis hirsutis differt. **Typus:** Queensland. PORT CURTIS DISTRICT: Upper Oaky Ck, Many Peaks Range, c. 24°11.5'S 151°17.5'E, 9149–263238, 5 Sep 1992, *M.F. Duretto* 269, *M. Bayly* & *N. Marsh* (holo: MEL [MEL 2036441]; iso: AD, BRI, CANB [CBG 9604106], DNA, K, MEL [MEL 2036442], NSW, PERTH). (Fig. 11S–X).

Boronia sp. Telford CBG7702560 (Batianoff & Dillewaard 1988).

Boronia sp. (Many Peaks Range I.R. Telford CBG7702560) (Forster 1997).

Erect, much branched shrub to 2 m tall. Multiangular stellate hairs sessile, with 10–20+ rays; rays unicellular, free, firm, straight, 0.1–0.25(–0.5) mm long, glossy, smooth, white to yellow (Fig. 13B). Branches terete to slightly

quadrangular in TS, not glandular, with little or no cork development, with a dense stellate indumentum, becoming glabrous with age, will regrow from a rootstock; decurrent leaf bases absent. Leaves simple, subsessile to petiolate; petiole 2–4 mm long; lamina not conspicuously glandular, elliptic, 18–35 mm long, 3.5–10 mm wide, strongly discolourous, paler beneath, with palisade and spongy mesophyll, with tip acute, with base attenuate; margins entire, flat to slightly recurved; midrib prominently raised abaxially, with tightly packed parenchyma with secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface glabrous or with few hairs along midrib; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs (Fig. 13B). Inflorescence 1(–3)-flowered, with a dense stellate indumentum; peduncle 0.5–2 mm long, deciduous with flower or rarely persistent; prophylls unifoliate, 2–5.5 mm long, 0.5–2.5 mm wide, with a dense stellate indumentum, or as leaves; metaxephylls 0.5–2.5 mm long; anthopodium 2–7 mm long. Sepals (Fig. 11U) broadly ovate-deltoid, 4.5–5.5 mm long, 2–2.5 mm wide, not enlarging significantly with mature fruit, with tip acuminate; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink to white, 7–8 mm long, 4–5.5 mm wide, enlarging to 12 mm long with mature fruit, with midvein raised abaxially; adaxial surface glabrous or glabrescent; abaxial surface with a moderate to dense stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate, tapering to anther connective, c. 2.5 mm long, the distal 0.5–1 mm prominently glandular (Fig. 11V); antepetalous filaments c. 2 mm long, the distal end slightly glandular (Fig. 11W). Anthers monomorphic; anther appendage large, erect or reflexed, glabrous. Disc entire, not surrounding base of filaments, glabrous (Fig. 11X). Ovary glabrous (Fig. 11X). Style hirsute. Coccus 4.5–6 mm long, 2.5–3.5 mm wide, glabrous or with few hairs along suture. Seeds black, shiny, 4–5 mm long, 2–2.5 mm wide, adaxial side without a ridge; elaiosome yellow-

white; surface at magnification as with *B. odorata* (see Fig. 10A,B).

Additional specimens examined: Queensland. PORT CURTIS DISTRICT: Upper Oaky Ck, Many Peaks Range, c. 24°11.5'S 151°17.5'E, Calliope 9149–263238, Sep 1992, *Duretto* 270–273, *Bayly & Marsh* (270 - BRI, CANB, MEL; 271 - BRI, CANB, DNA, K, MEL, NSW; 272 - BRI, MEL, NSW; 273 - BRI, CANB, HO, MEL, NSW, PERTH); Mt Castletower NP, eastern slopes of Many Peaks Range, 24°07'41"S 151°18'25"E, Feb 1995, *Forster* 16338 (MEL); SF521, Many Peaks Range, 24°12'42"S 151°20'31"E, Feb 1995, *Forster* 16255 (MEL); Many Peaks Range, *Olsen* 348 (NSW); Many Peaks Range, Mt Castletower, 24°10'S 151°17'E, *Telford* 5479 (BRI, CANB).

Notes: *Boronia bella* is closely related to *B. foetida* from which it can be distinguished by its larger flowers, larger hairs (Fig. 13A,B), and hirsute styles. Both these species can be distinguished from *B. jensziae* by having petals that are glabrous adaxially and from *B. excelsa* by having much wider leaves.

Distribution and ecology: Known only from the Many Peaks Range near Gladstone (Fig. 12). Found in eucalypt forest and woodland on granite-derived soils. Flowering material collected from May to September; fruiting material in September.

Conservation status: Batianoff & Dillewaard (1988) considered this species to be rare. Collections have been made within the Mount Castletower National Park so the species does not appear to be threatened. A ROTAP conservation code of 2RC– is therefore appropriate.

Etymology: The specific epithet is derived from Latin *bellus* (beautiful), and refers to the spectacular displays made by the species large, deep-pink flowers.

9. *Boronia hoipolloi* Duretto, sp. nov. a *Boronia alulata* Sol. ex Benth. paginis ubique dense hirsutis, et a *B. quinkanensis* Duretto foliolis angustioribus differt. **Typus:** Queensland. BURKE DISTRICT: Amphitheatre, a sandstone escarpment c. 27 km north of Musslebrook mining Camp, 18°21'S 138°09'E, 12 June 1995, *J.R. Clarkson* 10473 (holo: BRI; iso: MEL [MEL 2032037, MEL 2032038]) (Fig. 14A–E).

Pendulous or erect, much branched shrub to 50 cm long, with a dense stellate indumentum throughout. Multiangular stellate hairs sessile, with 4–12 rays; rays unicellular, free, firm, straight, to 0.2 mm long, glossy, smooth, white. Branches terete to slightly quadrangular in TS, not glandular, with little or no cork development, becoming glabrous with age; decurrent leaf bases absent. Leaves imparipinnate, with 7–25 pinnae, gradually increasing in number of pinnae along axillary branches, not conspicuously glandular, entire leaf 15–35 mm long, 5–13 mm wide; petiole winged, 2–5 mm long; rhachis segments winged, oval, 1.5–6 mm long, c. 0.5 mm wide; pinnae opposite or sometimes subopposite, narrowly-elliptic to linear, subsessile, with tip obtuse, margins entire and recurved, discolourous, slightly paler beneath, lamina with palisade and spongy mesophyll; midrib raised abaxially, with tightly packed parenchyma between midvein and abaxial epidermis with secondary thickening in cells in the layer above the epidermis only, impressed adaxially; adaxial surface with a dense stellate indumentum; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs; terminal pinnae longer than the most distal lateral pinnae but shorter than others, 1–8 mm long, 0.5–1 mm wide; lateral pinnae 1–7 mm long, 0.5–1 mm wide. Inflorescence 1–5-flowered; peduncle to 2 mm long, not deciduous with flower; prophylls unifoliate or pinnate, to 2.5 mm long; metaxyphylls minute; anthopodium 1–4 mm long. Sepals (Fig. 14C) narrowly deltoid, 2–3.5 mm long, 0.75–1.25 mm wide, not enlarging significantly with fruit, with tip acute to slightly acuminate; adaxial surface densely and minutely pubescent, becoming sparse to glabrous towards base or hirsute at tip only; abaxial surface with a moderate to dense stellate indumentum. Petals pink, 3.5–5 mm long, 1.5–2 mm wide, not enlarging significantly with mature fruit, with midvein raised abaxially; adaxial surface with a moderate simple indumentum, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Stamen filaments

capitate, tapering to anther connective, with stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments, c. 2 mm long, the distal c. 0.5 mm prominently glandular (Fig. 14D); antepetalous filaments 1–1.5 mm long, the distal end slightly glandular or eglandular (Fig. 14E). Anthers more or less monomorphic, appendage absent or minute. Disc entire, not surrounding base of filaments, glabrous. Ovary glabrous. Style hirsute or glabrous. Coccus (fully mature not seen) c. 3.5 mm long, c. 2 mm wide, glabrous or glabrescent. Seeds (mature not seen) grey, dull, 1.5–2 mm long, 1.5–2 mm wide, adaxial side without a ridge; elaiosome yellow-white; surface at magnification composed of collapsed tubercle like units, these units free and 10–30 μm across (Fig. 10 C,D)

Other specimen examined: Queensland. BURKE DISTRICT: Amphitheatre, 40 km (by road) north of Musslebrook Mining Camp, 18°21'S 138°10'S, May 1995, Johnson 779 & Thomas (BRI).

Notes: *Boronia hoipolloi* was referred to as '*Boronia* aff. *alulata* (NW Qld, Clarkson 10473)' by Duretto (1997). It can be distinguished from *B. alulata* by having a dense stellate indumentum on all its parts, from *B. quinkanensis* by its narrower leaf pinnae, and from *B. lanuginosa*, which is also found in NW Queensland, by its sepals being shorter and narrower than the petals, its petals having a distinctly raised midrib abaxially, and its dull seed lacking a conspicuous ridge on its adaxial side.

Seeds of *B. hoipolloi* are dull and the structures on its testa appear to be collapsed tubercles (Fig. 10C,D), quite unlike those of most other members of *Boronia* sect. *Valvatae* (cf. Fig. 10A,B, Duretto 1995, submitted, Duretto & Ladiges 1997, in press). Interestingly, *B. viridiflora* Duretto of the north-western Arnhem Land plateau, which is also a cliff dwelling species, also has dull seeds with apparently collapsed tubercles on the testa (Duretto & Ladiges 1997).

Distribution and ecology: Known only from two recent collections from The Amphitheatre, north of the Musslebrook Mining Camp in



Fig. 14. A–E, *Boronia hoipolloi*. A, flowering branchlet; B, flower; C, sepal; D, abaxial view of antesepalous stamen; E, abaxial view of antepetalous stamen. A–E, Clarkson 10473 (BRI). F–K, *B. quinkanensis*. F, flowering branchlet; G, flower; H, sepal; I, lateral view of antesepalous stamen; J, abaxial view of antepetalous stamen; K, lateral view of a coccus. F, K, Clarkson 3712 (BRI); G–J, Clarkson 9619 (MEL). L–Q, *B. duiganiae*. L, flowering branchlet; M, flower; N, sepal; O, abaxial view of antesepalous stamen; P, abaxial view of antepetalous stamen; Q, lateral view of a coccus. L, Thomas 137 (BRI); M–P, Duretto 319 (MEL); Q, Storey & Yapp 211 (NSW). R–X, *B. odorata*. R, flowering branchlet; S, flower; T, sepal; U, abaxial view of antesepalous stamen; V, abaxial view of antepetalous stamen; W, lateral view of a coccus; X, seed. R, Bean 2194 (BRI); S–V, Duretto 280 (MEL); W–X, Everist 8033 (CANB). Scale bar: A, F, L, R = 16 mm; B, G, M, S = 8 mm; C, H, K, N, Q, T, W, X = 4 mm; D–E, I–J, O–P, U–V = 2 mm. Figures 14F–X were prepared by Peter Neish for inclusion in *Flora of Australia* vol. 26 (in prep.) and are reproduced here with the permission of the artist and ABRS.

north-western Queensland (Fig. 12). Found in crevices in vertical sandstone cliff faces and on scree slopes (collectors' notes). Flowering material collected in May and June; fruiting material in June.

Conservation status: A ROTAP conservation code of 2R is appropriate for this species as the species is apparently common where found (J. R. Clarkson, pers. comm.; collectors' notes). Field research is required to ascertain the size and extent of the known population, and if indeed other populations exist elsewhere.

Etymology: The specific epithet, *hoipolloi*, is derived from Greek for rabble (*hoi polloi* or *oi polloi*), and refers to individuals of the species being found on the outer parts of an amphitheatre, where one expects to find 'the rabble' congregating.

10. *Boronia quinkanensis* Duretto, sp. nov. a *Boronia alulata* Benth. paginis ubique dense hirsutis et sepalis et petalis subaequilibus vel aequalibus, et a *B. hoipolloi* Duretto foliolis latoribus differt. **Typus:** Queensland. COOK DISTRICT: 22.4 km from Kennedy River on the Jedda Creek Track to King River Station, 15°41'S 143°47'E, 24 June 1981, J.R. Clarkson 3712 (holo: BRI [AQ348406]; iso: CANB [CANB 372104, CBG 8505343], DNA, K, MO, NSW [NSW 244358]) (Fig. 14F–K).

Boronia sp. "Jedda Creek" (J.R. Clarkson 3712); *Boronia* sp. "Mt Mulligan" (J.R. Clarkson 5769) (Thomas & McDonald 1989).

B. sp. (Mt Mulligan, J.R. Clarkson 5301) (Ross 1994; Forster 1997).

Boronia sp.4 (Mt Mulligan; J.R. Clarkson 5301 (Briggs & Leigh 1996).

Erect, much branched shrub to 2.5 m tall, with a dense stellate indumentum throughout. Multiangular stellate hairs sessile, with 7–15+ rays; rays unicellular, free, firm, straight, 0.1–0.5 mm long, glossy, smooth, white (Fig. 13C,D). Branches terete to slightly quadrangular in TS, not glandular, with little or no cork development, becoming glabrous with age; decurrent leaf bases absent. Leaves

imparipinnate, (1–)3–11 pinnae, gradually increasing in number of pinnae along axillary branches, not becoming unifoliolate with age, not conspicuously glandular, entire leaf 6–25 mm long, 4–15 mm wide; petiole winged, 1–5 mm long; rachis segments winged, broader at distal end, 1.5–6 mm long, 0.5–2 mm wide; pinnae elliptic to oblanceolate, subsessile, with tip obtuse, discolourous, paler beneath, lamina with palisade and spongy mesophyll; margins entire, recurved; midrib raised abaxially, with tightly packed parenchyma between midvein and abaxial epidermis with secondary thickening in cells in the layer above the epidermis only, impressed adaxially; adaxial surface with a sparse to moderate stellate indumentum; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs; terminal pinnae longer than the most distal lateral pinnae but shorter than others, (2–)6–15 mm long, (1–)3–7 mm wide; lateral pinnae (2–)5–11 mm long, (1–)3–5 mm wide. Inflorescence 1–3 (–9)-flowered; peduncle 1–23 mm long, not deciduous with flower; prophylls unifoliolate or pinnate, 2.5–5 mm long, 1.5–3 mm wide; metaxyphylls to 0.5 mm long; anthopodium 1–10 mm long. Sepals (Fig. H) narrowly deltoid, 3–5 mm long, 1–1.5 mm wide, not enlarging significantly with fruit, with tip acute to slightly acuminate; adaxial surface densely and minutely pubescent, becoming sparse to glabrous towards base; abaxial surface with a moderate to dense stellate indumentum. Petals pink to white, 4–5.5 mm long, 2–3 mm wide, enlarging to 6–7 mm long with mature fruit, with midvein raised abaxially; adaxial surface with a sparse simple indumentum, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Stamen filaments capitate, tapering to anther connective, with stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments, 1.5–2 mm long, the distal 0.5 mm prominently glandular (Fig. 14I); antepetalous filaments 1–1.5 mm long, the distal end slightly to strongly glandular (Fig. 14J). Anthers more or less monomorphic, apiculum present but minute. Disc entire, not surrounding base of filaments, glabrous. Gynoecium glabrous. Coccus 3.5–4.5 mm long, 2–2.5 mm wide,

glabrous or glabrescent (Fig. 14K). Seeds black, shiny, 3–4 mm long, 1.5–2 mm wide, adaxial side without a ridge; elaiosome yellow-white; surface at magnification as with *B. odorata* (see Fig. 10A,B).

Additional specimens examined: **Queensland.** COOK DISTRICT: Sandy Ck area N of Jowalbinna, 15°43'S 144°18'E, Jul 1990, *Bean* 1710 (BRI, NSW); Near Laura R., 15°45'S 144°39'E, Aug 1974, *Byrnes* 3079 (BRI, MEL, NSW); 4 km S of the crossing of Shepherd Ck on the Maytown Track, 15°47'S 144°16'E, Jun 1992, *Clarkson* 9619 & *Nelder* (BRI, DNA, K, L, M, MBA, MEL, NSW, PERTH, QRS); 6 km south of Jowalbinna turn off on the Maytown track, 15°48'S 144°16'E, Nov 1983, *Clarkson* 5050 (CANB); Mount Mulligan, c. 30 km NW of Dimbulah, 16°48'S 144°49'E, Jun 1995, *Clarkson* 10541 (BRI, MBA, MEL); Mt Mulligan, c. 40 km NW of Dimbulah, 16°52'S 144°51'E, Apr 1985, *Clarkson* 5769 (BRI, CANB, DNA, MBA, MEL, QRS); *ibid.*, Apr 1987, *Clarkson* 6914 (DNA, CANB, MBA, MEL); Mt Mulligan, on the southern plateau of the mountain, 16°54'S 144°51'E, Apr 1984, *Clarkson* 5301 (BRI, CANB, DNA, MBA, NSW, PERTH, QRS); SSW part of Mt Mulligan, c. 16°53'S 144°51'E, May 1993, *Duretto* 380, 385, 388, 389 & *Vadala* (380 - MEL; 385 - BRI, CANB, DNA, K, MEL, NSW, PERTH; 388 - AD, BRI, MEL; 389 - AD, BRI, CANB, DNA, MEL, NSW); Foot of cliffs, Mt Mulligan, 16°52'S 144°52'E, Dec 1936, *Flecker* s.n. (QRS); The Gorge, Mt Mulligan, Apr 1934, *Flecker* s.n. (BRI); 35 km directly SW of Laura, just below escarpment of Pine Tree Ck, 15°47'S 144°12'E, Apr 1987, *Parris* 9198 (BRI, CANB); 35 km SW of Laura, on plateau leading to escarpment above Brady Ck, 15°47'S 144°13'E, May 1987, *Parris* 9200 (BRI, CANB, NSW); c. 42 km directly SSW of Laura, & c. 2 km W of Maytown track just above escarpment of Mossman Ck, 15°55'S 144°18'E, May 1987, *Parris* 9190 (CANB); Jowalbinna camp, c. 30 km SSW of Laura, 15°45'S 144°15'E, Jun 1990, *van der Werff* 11716 (QRS).

Notes: The Flecker specimen from The Gorge, Mt Mulligan, collected in April 1934 (BRI), referred to as *B. artemesiifolia* F.Muell. (= *B. lanuginosa*) by White (1942), is probably the first collection of *B. quinkanensis* held in any herbarium. Both Hnatiuk (1990) and Ross (1994) were probably either referring to White (1942) or to incorrectly determined specimens of *B. quinkanensis* when they stated that *B. lanuginosa* (includes *B. artemesiifolia*) had been collected in the Cook district of Queensland. *Boronia lanuginosa* has only recently been collected from north-western Queensland (P.I. Forster pers. comm.; Duretto submitted).

Boronia quinkanensis is not easily confused with any other species of *Boronia* in north-eastern Queensland as it is the only

species with a dense indumentum throughout. It is distinguished from *B. lanuginosa* by its more ovate leaflets, its sepals never being wider and rarely longer than its petals, its petals having a distinctly raised midrib abaxially, and its seed lacking a conspicuous ridge on its adaxial side. From *B. hoipolloi* it is distinguished by its much wider leaflets.

Distribution and ecology: Occurs in the 'Quinkan' sandstone country south of Laura, and also on Mt Mulligan (near Dimbulah) to the south of that (Fig. 12). Found in woodland and heath, on sandstones. These sandstones, Mesozoic in origin, are extensive in the Laura area with an isolated occurrence of the 'pepper pot' type on Mt Mulligan (Keyser & Lucas 1968; Arnold & Fawckner 1980). Surrounding these sandstones are the Hodgkinson formations of greywacke, siltstones, shale, slates etc. (Arnold & Fawckner 1980) on which *B. quinkanensis* is not found. Flowering and fruiting material collected from April to December.

Conservation status: Briggs & Leigh (1996) gave a ROTAP conservation code of 3K to this taxon, but a conservation code of 3R is more appropriate as the species does not appear to be under any immediate threat.

Etymology: The specific epithet is derived from the name of the area where this species is commonly found, the so-called Quinkan country.

11. *Boronia duiganiae* Duretto, sp. nov. a *Boronia lanceolata* F. Muell. et *B. odorata* Duretto foliis pinnatis cum indumento adaxialis moderato ad densum differt. **Typus:** Queensland. LEICHHARDT DISTRICT: Consuelo, 16 miles SW of Rolleston Township, 1 September 1961, *Lazarides & Storey* 116 (holo: CANB [CANB 112028]; iso: AD [AD 96244143], BRI [AQ 121206], MEL [MEL 250602], NSW [NSW 238032]).

Erect, much branched shrub to 2 m tall. Multiangular stellate hairs sessile, with 10–25+ rays; rays unicellular, free, firm, straight, c. 0.75(–1) mm long, glossy, smooth, becoming weak, flexuous and dull with age, white to

yellow (Fig. 13E). Branches terete, not glandular, with little or no cork development, with a dense stellate indumentum, becoming glabrous with age; decurrent leaf bases absent. Leaves imparipinnate, 1–5 pinnae, gradually increasing in number of pinnae along axillary branches, not conspicuously glandular, entire leaf (6–)13–45 mm long, (3–)6–35 mm wide; petiole winged, 2–8 mm long; rhachis segments winged, oval shaped or triangular with distal end wider, 4–10 mm long, 1–2 mm wide; lamina slightly to strongly discolourous, paler beneath, lamina with palisade and spongy mesophyll; margins entire and flat to recurved; midrib raised abaxially, with tightly packed parenchyma with secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface with a sparse to moderate (rarely dense) stellate indumentum; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs (Fig. 13E); pinnae elliptic to oblanceolate, sessile to subsessile, petiolule to 1 mm long, with tip obtuse; terminal pinnae longer than lateral pinnae, 6–31 mm long, 3–12 mm wide; lateral pinnae 5–17 mm long, 2.5–8 mm wide. Inflorescence 1–3-flowered, with a dense stellate indumentum; peduncle 0.5–1 mm long; prophylls unifoliate or pinnate, 1–5 mm long, to 1.5 mm wide; metaxephylls minute; anthopodium 1–2 mm long. Sepals (Fig. 14N) ovate-deltoid, 3.5–5 mm long, 2–3 mm wide, not enlarging significantly with fruit, with tip acuminate; adaxial surface glabrescent; abaxial surface with a dense stellate indumentum. Petals pink to white, 6–11 mm long, 3–6 mm wide, enlarging slightly with mature fruit, with midvein raised abaxially; adaxial surface with a sparse to moderate simple indumentum becoming glabrous towards base; abaxial surface with a moderate to dense stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate, tapering to anther connective, 2–2.5 mm long, the distal 0.5–1 mm prominently glandular (Fig. 14O); antepetalous filaments c. 1.5 mm long, the distal end glandular (Fig. 14P). Anthers monomorphic; anther apiculum minute or large and reflexed, glabrous. Disc entire, not surrounding base of filaments, glabrous. Gynoecium glabrous. Coccus 4–5.5 mm

long, 2–3 mm wide, with a sparse to moderate indumentum (Fig. 14Q). Seeds black, shiny, 4–4.5 mm long, 2–2.5 mm wide, adaxial side without a ridge; elaiosome yellow-white; surface at magnification as with *B. odorata* (see Fig. 10A,B). (Fig. 14 L–Q).

Additional selected specimens (c. 20 collections examined): Queensland, LEICHHARDT DISTRICT: Staircase Range, 22 km SE of Springsure, 24°13'S 148°14'E, Sep 1993, *Bean* 6910 (MEL); 20 km from Springsure towards Rolleston, 24°13'S 148°14'E, Sep 1992, *Duretto* 314–319 (314 - BRI, CANB, MEL, NSW, PERTH; 315 - AD, BRI, MEL, NSW; 316 - BRI, CANB, MEL, NSW; 317–318 - BRI, CANB, MEL, NSW; 319 - MEL); Hilltop, 9.35 km N of 1st Carnarvon Gorge turnoff & 125.35 km N of Injune, 24°32'S 148°31'E, Sep 1992, *Duretto* 320–324 & *Bayly* (320 - BRI, CANB, MEL, NSW, PERTH; 321 - BRI, MEL; 322–333 - BRI, CANB, MEL, NSW; 324 - AD, BRI, CANB, MEL, NSW); Stonecroft Caves [c. 24°55'S 149°33'E] N of Taroom, Jul 1958, *Gray* DMG4370 (BRI); Ceres holding, 10.8 km (by road) W of Rolleston-Injune Rd at Christmas Ck Crossing, Springsure 1:250000 (673917), 24°48'S 148°29'E, Aug 1978, *Martensz* 1082A (CANB); Carnarvon Gorge, 25°0–'S 148°1–'E, Aug 1989, *Morley* s.n. (BRI); Near Dawson highway on Expedition Ra., 24°4–'S 149°0–'E, Aug 1988, *Phillips* s.n. (BRI); Rolleston Rd, c. 13 miles from Springsure township, Sep 1962, *Storey & Yapp* 211 (AD, BRI, CANB, MEL, NSW); Mt Moffatt section of Carnarvon National Park behind Tambo Bluff, 25°02'S 147°27'E, Sep 1986, *Thomas* 137 (BRI); Orion Downs, *Wuth* s.n. (MEL). MARANOA DISTRICT: 'The Tombs', Maranoa R, West Branch, Carnarvon NP, Apr 1981, *Blaxwell* 1892 (BRI, NSW); Mt Moffatt NP, 25°0–'S 147°5–'E., Sep 1988, *Hando* 454 (BRI); Mt Moffatt turnoff to Kenniffs Cave, 25°01'S 147°57'E, Sep 1986, *Williams* 86083 (BRI).

Notes: *Boronia duiganiae* is not easily confused with any other taxon except *B. odorata* from which it can be distinguished by having pinnate leaves that usually have a moderately dense indumentum adaxially and hairs with longer rays (to 1 mm long as opposed to 0.1 mm long; Fig. 13E). Many specimens of it have previously been determined as *B. obovata* C.T White, which is endemic to the Blackdown Tableland area. *Boronia duiganiae* has ovate-deltoid sepals with a dense indumentum on the abaxial surface (the epidermis is not visible) which gives the sepal the light cream or tan colour, while *B. obovata* has narrowly deltoid sepals with a moderate indumentum on the abaxial surface (the abaxial surface is visible) and are dark brown.

Distribution and ecology: Restricted to the Great Dividing, Carnarvon and Expedition

Ranges, south and south-west of Springsure and Rolleston (Fig. 12). Found growing in open woodland or forest on sandstone. Flowering material collected from February to November; fruiting material from September to November.

Conservation status: As the species is found in Carnarvon Gorge National Park and Mt Moffatt National Park, a ROTAP conservation code of 2RC- is appropriate.

Etymology: The species is named in honour of Dr Suzanne L. Duigan (1924–1993) in recognition for her long and distinguished career at the School of Botany, the University of Melbourne.

12. *Boronia odorata* Durretto, sp. nov. a *Boronia lanceolata* F.Muell. foliis juvenalibus trifoliolatis, floribus majoribus (petalis (4–)6–11 non 2–5.5(–7) mm longis) et filamentis hirsutis differt. **Typus:** Queensland. LEICHHARDT DISTRICT: Bull Creek Gorge, 15 km W of ‘Castlevale’, 24°30’S 146°52’E, 3 September 1990, *A.R. Bean* 2194 (holo: BRI [AQ474979]; iso: NSW) (Fig. 14R–X).

Erect, much branched shrub to 2 m tall. Multiangular stellate hairs sessile, with 5–25 rays; rays unicellular, free, firm, straight, 0.05(–0.1) mm long, glossy, smooth, white to red-brown. Branches terete to slightly quadrangular in TS, not glandular, with little or no cork development, with a dense stellate indumentum, becoming glabrous with age; decurrent leaf bases absent. Leaves simple at maturity but juvenile leaves trifoliolate for several nodes, not conspicuously glandular, subsessile to petiolate; petiole winged, 1–8 mm long; pinnae or unifoliolate leaf elliptic, with tip obtuse, strongly discolourous, paler beneath, lamina with palisade and spongy mesophyll; margins entire, flat to recurved (becoming revolute on drying); midrib raised abaxially, with tightly packed parenchyma with secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface with a sparse to moderate stellate indumentum; abaxial surface with a dense indumentum of two hair types, a moderate layer of multiangular stellate hairs over a dense layer of peltate stellate hairs; juvenile leaves trifoliolate, initially glabrous,

becoming more hirsute with each node until as hirsute as mature leaves; unifoliolate and terminal pinnae longer than lateral pinnae, (5–)12–40 mm long, (2–)4–8 mm wide; lateral pinnae 10–15 mm long, 2–4 mm wide. Inflorescence 1–3(–7)-flowered, with a dense stellate indumentum; peduncle 1–2 mm long, not deciduous with flower; prophylls unifoliolate, 1–4 mm long, 0.5–2 mm wide, with a dense stellate indumentum or as leaves; metaxyphylls minute; anthopodium 1–7 mm long. Sepals (Fig. 14T) ovate-deltoid, 2–4.5 mm long, 1–2.5 mm wide, not enlarging significantly with mature fruit, with tip acute to slightly acuminate; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink to white, (4–)6–10 mm long, 4–6 mm wide, enlarging to 8–11 mm long and 5–7 mm wide with mature fruit, with midvein raised abaxially; adaxial surface moderately simple pubescent; abaxial surface with a moderate to dense stellate indumentum. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate, tapering to anther connective, 2–2.5 mm long, the distal c. 1 mm prominently glandular (Fig. 14U); antepetalous filaments c. 1.5 mm long, the distal end glandular (Fig. 14V). Antepetalous anther slightly larger than antesealous anthers before dehiscence; anther apiculum large, reflexed, glabrous. Disc entire, not surrounding base of filaments, glabrous. Gynoecium glabrous. Coccus (4–)5.5–7 mm long, (2–)3–3.5 mm wide, glabrous or sparsely hirsute (Fig. 14W). Seeds black, shiny, 3.5–5 mm long, 2.5–3 mm wide, with adaxial side without a ridge; elaiosome yellow-white (Fig. 14X), surface at magnification tuberculate; tubercles erect, unicellular, 10–44 µm across, free, with surface smooth and anticlinal walls not visible (Fig. 10 A,B).

Additional selected specimens (c. 40 collections examined): Queensland. LEICHHARDT DISTRICT: 6 miles W of ‘Mt Playfair’ Station, 24°52’S 146°51’E, Oct 1964, *Adams* 1356 (AD, BRI, CANB); 1.5 miles S of Ball Ck & Robinson Ck junction, Glenhaughton holding, Oct 1974, *Clarkson* s.n. (BRI); 26 km WSW of Bauhinia Downs on the Dawson Hwy towards Rolleston, 24°39’S 149°02’E, Sep 1992, *Durretto* 288–292, *Bayly & Marsh* (288 - BRI, MEL, NSW; 289–291 - BRI, MEL; 292 - BRI, CANB, MEL, NSW); E of car park & camping area, Isla Gorge NP, 25°12’S 149°59’E, Sep 1992, *Durretto* 280–285 (280 - BRI, MEL; 281 - BRI, MEL; 282 - BRI,

CANB, MEL; 283 - MEL; 284-285 - BRI, MEL, NSW); Isla Gorge, c. 18 miles SW of Theodore, 25°09'S 149°57'E, Sep 1968, *Everist* 8033 (AD, BRI, CANB, NSW); Glenmore Gap, 13 km WSW of Theodore, 24°58'S 149°57'E, Mora Map 8848-969354, Sep 1986, *Forster* 2637 (BRI, CANB, MEL); 10 km S of Isla Gorge lookout, 37 km S by road from Theodore, 25°05'S 150°00'E, Jun 1971, *Johnson* 7203 & *Briggs* (BRI, NSW); Bauhinia Downs, 24°34'S 149°17'E, Feb 1968, *Jones* 3729 (CANB); W of Moura, Apr 1961, *Jones* 1814 (BRI); Watershed 23 miles ESE of Rolleston Township, 24°35'S 148°56'E, Aug 1961, *Lazarides* & *Storey* 112 (BRI, CANB, MEL, NSW). WARREGO DISTRICT: SW boundary of Chesterton NP, 26°13'S 147°20'E, Jul 1995, *Dollery* 84 (BRI); Mt Mobil Holding, 15-20 km W of Umerill Homestead, 26°14'S 147°25'E, Nov 1990, *Grimshaw* CHR20 (BRI). MARANO DISTRICT: SE of Surat, Thomby Range, May 1960, *Blake* 21293 (BRI, CANB, NSW, PERTH); Thomby Range, Glenmorgan-St. Georges Rd, Aug 1948, *Gordon* 115 (BRI); Claravale, c. 37 miles N of Mitchell on stony ridge, May 1962, *Johnson* 2434 (BRI, CANB).

Notes: Specimens of a trifoliolate and glabrous *Boronia* taxon that were thought to be a form of *B. glabra* by Stanley & Ross (1983) are probably juvenile specimens of *B. odorata*. Plants of this species from Isla Gorge and Thomby Range often have a more dense stellate indumentum on the adaxial surfaces of the leaves than do those of the typical form, and may, with further collections and research, be found to represent a distinct taxon. The majority of herbarium specimens of *B. odorata* seen have only simple leaves. Trifoliolate leaves are produced on the primary axis only, and then for only a few nodes. In *Boronia* sect. *Valvatae* this ontogenetic sequence also occurs in *B. pauciflora* W.Fitzg. (NW WA) (Duretto 1997), while some normally pinnate leaved species produce simple leaves as the plant ages, e.g. *B. keysii* (SE Qld), *B. ledifolia* (NSW, Vic.), *B. ruppii* Cheel (NSW), and *B. ternata* Endl. (SW WA) (Duretto 1995, submitted).

Boronia odorata can be distinguished from *B. duiganiae* by its simple mature leaves that have a sparse to moderate indumentum on the adaxial surface, and hairs with shorter rays (to 0.1 mm long rather than to 1 mm long). From *B. lanceolata* F.Muell. (NW Qld, N.T.) it may be distinguished by its larger flowers and pilose rather than glabrous staminal filaments (Duretto 1997), and from *B. jenziaae*, *B. excelsa*, *B. foetida* and *B. bella* by its trifoliolate juvenile leaves and

its sparse to moderate stellate indumentum, as apposed to being glabrous, on the adaxial surface of the leaves.

Distribution and ecology: Restricted to the Central Highlands of Queensland in an area approximately bounded by Springsure, Theodore, Surat, Mitchell and Tambo (Fig. 12). Found in open woodland on sandstone. Flowering material collected from February to October; fruiting material from April to November.

Conservation status: As *B. odorata* is widespread, though not evenly collected, and found in some conservation reserves, e.g. Isla Gorge and Expedition Range National Parks, it is not considered to be under threat.

Etymology: The specific epithet is derived from Latin, *odoratus* (smelling), and refers to the unpleasant (to some) tar/coffee odour of the leaves when crushed.

13. *Boronia squamipetala* Duretto, sp. nov. a *Boronia bowmanii* F. Muell. petalis majoribus (4-8 non 3-4 mm longis) indumento denso abaxialiter differt.

Typus: Queensland. COOK DISTRICT: 19 km from Peninsular development Rd on a track to Wolverton via the Cook Tin Mine, 13°21'S 143°3'E, 23 June 1993, *J.R. Clarkson* 10112 & *V.J. Neldner* (holo: MEL [MEL 2036781]; iso: BRI [AQ 621834], K, L, MBA, MEL [MEL 2036782]).

Boronia sp. "Massy Creek, Rocky River" (R. Coveny 7174) (Thomas & McDonald 1989).

Boronia sp. 3 (Massy Creek, Rocky River; R. Coveny 7174) (Briggs & Leigh 1996).

Boronia sp. (Massy Creek R.G. Coveny+ 7174) (Forster 1997).

Erect, much branched shrub to 1 m tall. Multiangular stellate hairs sessile, with 6-23+ rays; rays unicellular, fused and appressed, appearing peltate at times, firm, straight, 0.1-0.3(-0.5) mm long, glossy, smooth, white (Fig. 13F). Branches quadrangular in TS, not conspicuously glandular, with little or no cork development, with

a sparse to moderate stellate indumentum, becoming glabrous with age; decurrent leaf bases absent. Leaves imparipinnate, with 5–13 pinnae, not conspicuously glandular, 33–55 mm long, 12–20 mm wide, glabrescent or with a sparse indumentum, with hairs mainly on midrib; petiole winged, 6–15 mm long; rhachis segments winged, broader at distal end, 2–10 mm long, 1–3 mm wide; pinnae sessile, elliptic, slightly discoloured, paler beneath, lamina with palisade and spongy mesophyll, with tip acute; margins entire and flat to slightly recurved; midrib not or slightly raised abaxially, with tightly packed parenchyma between midvein and abaxial epidermis with secondary thickening in cells in the layer immediately above the epidermis only, slightly impressed adaxially; terminal pinnae longest, 8–20 mm long, 2–6 mm wide; lateral pinnae 3–13 mm long, 1–3 mm wide. Inflorescence (1–)3–7-flowered, with a sparse to moderate stellate indumentum; peduncle 1–2 mm long, woody, not deciduous with flower; prophylls linear, unifoliate or pinnate, 1–3 mm long, 0.5–1 mm wide; metaxyphylls minute, to 0.5 mm long; anthopodium 2–6 mm long. Sepals ovate-deltoid, c. 2 mm long, c. 1 mm wide, not enlarging significantly with fruit, with tip acute; adaxial surface glabrous to glabrescent with few hairs along margin at tip; abaxial surface glabrescent or with a sparse to moderate stellate indumentum, hairs concentrated at base. Petals white to green, 4–7 mm long, 2.5–4 mm wide, enlarging to 6–8 mm long with mature fruit, with midvein not raised abaxially; adaxial surface glabrous or with a sparse simple indumentum, mainly at tip and along margins; abaxial surface with a moderate stellate indumentum with hairs concentrated along midrib. Stamen filaments bearing stiff simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate, tapering to anther connective, c. 1.5 mm long, the distal 0.5–0.75 mm prominently glandular; antepetalous filaments smooth, c. 1 mm long. Anthers monomorphic, appendage absent or minute to large and erect, glabrous. Disc entire, not surrounding base of filaments, glabrous. Gynoecium glabrous. Coccus 4–5.5 mm long, 2.5–3 mm wide, glabrous. Seeds black, shiny, 3–4 mm long, 1.5–2 mm wide, adaxial side without a ridge; elaiosome yellow-white; surface at magnification as with *B. odorata* (see Fig. 10A,B).

Additional specimens examined: Queensland. COOK DISTRICT: 4.2 km (2.6 miles) by road E of Wenlock R. towards Pascoe river on Iron Range Rd, 124 km by road NNW of Coen PO, 13°06' 142°59'E, Sep 1975, *Coveny* 7174 & *Hind* (BRI, MELU, NSW, PERTH); 13 km along road to Leo Ck mine, McIlwraith Range, 13°43'S 143°12'E, Jun 1992, *Forster* 10098 (BRI, MEL); 3.5 km NNE Massy Ck crossing, Silver Plains Station, eastern fall of McIlwraith Range, 13°53'S 143°31'E, Jul 1993, *Forster* 13618 (CANB, MEL, NSW); 8 miles from Kennedy Rd on Leo Ck Track, 13°3–'S 143°2–'E, Jul 1968, *Gittens* 1781 (BRI, CANB, NSW); Bacon Ck, Archer R., 13°20'S 142°50'E, Jul 1972, *Hyland* 6239 (BRI, CANB, NSW, QRS); 10 miles N of Archer R. on Kennedy Rd, 13°25'S 142°50'E, Oct 1973, *Hyland* 7014 (BRI, QRS); Between Massy Ck & Rocky R. on Cape York Rd, 13°55'S 143°30'E, Sep 1971, *Hyland* 5515 (BRI, MEL, QRS); T.R. 14, Leo Ck Rd, 13°40'S 143°20'E, Sep 1972, *Irvine* 372 (QRS); Heathlands Pastoral Station on road between the slaughter yard & the Telegraph Line road, 11°47'S 142°30'E, May 1980, *Morton* 631 (BRI); 45 km N of Coen on Cape York Rd, Jun 1972, *Wrigley* & *Telford* NQ1710 (BRI, CANB).

Notes: *Boronia squamipetala* is closely related to *B. bowmanii* (Durretto & Ladiges in press; Durretto 1995, submitted) from which it can be distinguished by its shorter and wider leaflets, and its larger petals that have a dense, rather than a sparse to moderate, peltate indumentum abaxially.

Distribution and ecology: Occurs mainly in the Iron and McIlwraith Ranges in Cape York Peninsula (Fig. 12). Found in open woodland or forest and heath on loams, sand, or rock pavements. Flowering and fruiting material collected from May to October.

Conservation status: Though this taxon was given a ROTAP conservation code of 2K by Briggs & Leigh (1996), because of its wider geographical range, a code of 3RC- is more appropriate. It is probably represented in Iron Range and McIlwraith Range National Parks.

Etymology: The specific epithet is derived from Latin, *squamosus* (scaly) and *petala* (petals), and refers to the scaly appearance of the petals when viewed at low magnification. This scaly appearance is attributable to the fused rays of the densely packed hairs.

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Appendix 1. Voucher specimens for leaf anatomical data. Principal collector given only. All vouchers lodged at MEL. An ‘*’ indicates that material was removed from a herbarium sheet and rehydrated. All other material was removed from pickled collections.

B. bella (Duretto 269); *B. duiganiae* (Duretto

320); *B. excelsa* (Forster 17248); *B. foetida* (Duretto 263); *B. forsteri* (Forster 11429); *B. hoipolloi* (Clarkson 10473); *B. jensziae* (Duretto 409); *B. odorata* (Duretto 282, 289); *B. palasepala* (Duretto 279); *B. quinkanensis* (Duretto 385, Clarkson 9619); *B. rosmarinifolia* (Duretto 102, 257); *B. splendida* (Duretto 337); *B. squamipetala* (Clarkson 10112).

Taxonomic status and Australian distribution of the weedy neotropical grass *Leptochloa fusca* subsp. *uninervia*, with an updated key to Australian *Leptochloa* (Poaceae, Chloridoideae)

Neil Snow¹ and Bryan K. Simon²

Summary

Snow, Neil & Simon, Bryan K. (1999). *Austrobaileya* 5(2): 299–305. The neotropical grass *Leptochloa fusca* subsp. *uninervia* is reported for the first time in Queensland, Western Australia, Northern Territory, South Australia and Tasmania, and its weedy tendencies are discussed. A brief overview is given regarding the taxonomy of *Leptochloa*, including why *Diplachne* P. Beauv. is no longer recognised, and of the *L. fusca* species complex. An updated key is provided for the fourteen confirmed taxa of Australian *Leptochloa*.

Keywords: *Leptochloa*, Poaceae, Chloridoideae, Australia, weediness, systematics.

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Introduction

During fieldwork in April of 1996 in Bowen, Queensland, we encountered a large population of the neotropical grass *Leptochloa fusca* (L.) Kunth subsp. *uninervia* (J. Presl) N. Snow. Until recently (Snow 1997a, 1998; Snow & Davidse 1998) this taxon was recognised as a distinct species (Gould 1975; McVaugh 1983; Nicora 1995; Snow 1996). Prior to this report *L. fusca* subsp. *uninervia* was only known in Australia from a single collection in New South Wales (Jacobs & McClay 1993). Recent monographic work on the genus worldwide (Snow 1997a) has confirmed its presence in the Australian states of Queensland, Western Australia, Northern Territory, South Australia and Tasmania. Before discussing the weedy properties and distribution of this taxon, a brief discussion is necessary regarding the systematics of the genus, and of the species complex to which *L. fusca* subsp. *uninervia* belongs.

Systematics of *Leptochloa sensu lato*

Leptochloa sensu lato frequently has been split by Australian, African, and South American workers into *Leptochloa* s.s. and *Diplachne* P. Beauv. (Simon 1993; Gibbs-Russell et al. 1991; Nicora 1995). However, since cladistic studies consistently rejected the null hypothesis that *Diplachne* represents a monophyletic clade distinct from *Leptochloa*, *Diplachne* has been reduced to synonymy under *Leptochloa* (Snow 1997a, 1998).

Systematics and nomenclature of the *Leptochloa fusca* complex

Leptochloa fusca subsp. *uninervia* belongs to the highly polymorphic species *L. fusca*, which occurs worldwide in warm temperate and tropical regions (Correll & Johnston 1970; Phillips 1974; Lazarides 1980; Stanley and Ross 1989; Scholz and Böcker 1996; Snow 1997a). The nomenclature associated with *L. fusca* has been tortuous and ambiguous. A few authors have begun using the epithet '*malabarica*' rather than the much more widely

known '*fusca*', and for this reason rejection of the epithet '*malabarica*' has been proposed (Snow & Davidse 1998). Morphological forms of *L. fusca* s.l. that appear relatively distinct regionally often have been accorded formal taxonomic recognition at various ranks. Consequently, dozens of names have been given to local forms.

The recent revision of *Leptochloa* (Snow 1997a) reconsidered the systematics of this species group. Included in the re-evaluation were several thousand herbarium specimens from all continents except Antarctica, and fieldwork on three continents (North America, Africa, Australia). Univariate statistical studies of herbarium specimens and population samples from the field (Snow in prep.) were unable to find characters that could consistently diagnose separate species in this group by ordinary morphological means (Snow 1997b), with the exception of the rare African species *Leptochloa gigantea* (Launert) T. A. Cope & N. Snow. However, multivariate statistical studies (Snow in prep.) of population samples ($n=20$) from the USA, Mexico, Botswana, Namibia, and Australia, supported recognition of four subspecies, given a general tendency of populations to segregate into four entities. Of the four recognised subspecies (Snow 1997a), three occur in Australia, including *L. fusca* subsp. *uninervia*, *L. fusca* subsp. *fusca* (into which *Diplachne parviflora* (R. Br.) Benth. and *Diplachne reptatrix* (L.) Druce have been synonymised), and *L. fusca* subsp. *muelleri* (Benth.) N. Snow (Snow 1998).

Weediness and geographical distribution of *Leptochloa fusca* subsp. *uninervia*

The occurrence of *Leptochloa fusca* subsp. *uninervia* should be of interest to the agricultural community in Australia. Like several other species in the genus, *L. fusca* subsp. *uninervia* has pronounced weedy tendencies (Häfliger & Scholz 1981: 98; McIntyre et al. 1988) and frequently can be seen growing in mesic soils of agricultural crops (Snow pers.

obs.). Given the high vagility and high germination rates of seed in the genus (Snow unpubl.), *L. f.* subsp. *uninervia* has the potential to spread rapidly within Australia as a weed. This potential is made even more likely by its remarkable salinity tolerance (McVaugh 1983; Jacobs & McClay 1993) and its ability to grow in seasonally inundated habitats, properties common to the species complex to which it belongs (Snow 1997a). Since the seed can overwinter in the soil under normal conditions in a continental climate at ca. latitude 39°N in St. Louis, Missouri (Snow pers. obs.), its weedy potential in Australia probably covers the entire continent at lower elevations. The related and morphologically variable *Leptochloa fusca* subsp. *fusca* has been amply documented as a weed of rice crops in Australia (McIntyre 1985; McIntyre et al. 1989). *Leptochloa fusca* subsp. *uninervia* commonly grows in semi-disturbed, seasonally inundated locations, and thus is found frequently in roadside ditches, along sandbars of streams and smaller rivers, and in mesic agricultural situations. Since it does not compete well ecologically with other species, it often occupies somewhat bare areas (Snow pers. obs.). Contrary to the otherwise accurate presentation in Häfliger & Scholz (1981), *Leptochloa fusca* subsp. *uninervia* is often geniculate below and frequently roots at the lower nodes (Snow 1997a). The fringed appearance of the ligule (Häfliger & Scholz 1981) is an artefact of mechanical damage, the undamaged condition being apically attenuated.

The native range of the *L. fusca* subsp. *uninervia* is from the southern third of the United States, the West Indies, and south through Argentina (Gould, 1975; Häfliger & Scholz, 1981; Nicora, 1995; Snow 1997a). However, in addition to Australia, this taxon has become introduced in a number of regions, including Saudi Arabia, Egypt, the Canary Islands, and New Zealand (Snow 1997a). Except for the lemma, which is apically attenuate in its undamaged state (Fig 1; shown erroneously as bi-lobed), an excellent illustration of *Leptochloa fusca* subsp.

uninervia from Mason (1957) is reproduced here (Fig. 1.) by permission of the University of California Press (Copyright 1957 by Regents of the University of California; © renewed 1985 by Herbert Mason). In the New World *L. fusca* subsp. *uninervia* is commonly called 'Mexican Sprangletop' (Gould, 1975: 229), 'Zacate Salado Mexicano', or 'Zacate Gigante Peruano' (Beetle et al., 1991: 291).

The only known previous Australian collection (Jacobs & McClay, 1993) was in August of 1992 from the Newington Naval Arms Depot, Homebush Bay, on the central coast of New South Wales (Jacobs 6546, NSW).

Additional Australian localities: **Queensland.** NORTH KENNEDY DISTRICT: Bowen, in ditches along roadside; locally

common in shallow water; GPS 20°00'35", 148°13'40" E; 13 April 1996, *Snow* 7387 & *Simon* (BRI, MO, NE and duplicates to be distributed). **PORT CURTIS DISTRICT:** Awonga Dam, Iveragh Reach, 15 km SE of Calliope, *Gibson* TO1347 (BRI). **SOUTH KENNEDY DISTRICT:** Munbura Road, Alligator Creek Mackay, 17 Nov 1994, *Tilley* s.n. (BRI). **New South Wales.** Newington Naval Arms Depot, Homebush Bay, *Jacobs* 6546 (NSW). **Western Australia.** Tank near Milbillillie H/S, *Craven* 5383 (CANB, MO); Kimberley Research Station, Kununurra, *Parker* 471 (BRI); Carawine Gorge, ca 140 km SE of Shay Gap, *Newbey* 10463 (CANB); Corong Creek, Woodstock Station, S of Port Hedland, *Burbidge* 58454 (CANB); Department of Agriculture Experimental Farm, Kununurra, *Gilbey* s.n. (CANB). **Northern Territory.** Elparpa Swamp, *Latz* 7607 (NSW); Palm Valley, 12 mi SW of Hermannsburg, Mission, *Lazarides* 5290 (NSW). **South Australia.** Barker Inlet South Wetland, Wingfield, Adelaide, 8 Apr 1997, *Green* 1988 (BRI). S.A. Water's Bolivar Sewage Treatment Works, Bolivar & St. Kilda, Adelaide, 8 Apr 1997, *Green* 1993 (BRI). **Tasmania.** Woodbury, *Black* 1270.635 (CANB, MO).

Synopsis and key to Australian *Leptochloa* (sensu Snow 1997)

With the recent discovery of the new species *Leptochloa southwoodii* in Queensland (Snow & Simon 1997), a first record of *L. panicea* subsp. *panicea* from Mt. Isa (Snow 1997a), and this report of *L. fusca* subsp. *uninervia*, the number of taxa in *Leptochloa* for Australia stands at fourteen. Details regarding nomenclature and synonymy will be published in the future (or see Snow 1997a). Taxa in the following key with an asterisk are adventive in Australia.

1. Panicle branches digitate or subdigitate 2
Panicle branches not digitate or subdigitate 3
2. Culms 'woody'; leaf blades deciduous at base **L. digitata**
Culms not 'woody'; leaf blades not deciduous at base **L. dubia***
3. Hidden inflorescences in axils of sheaths present **L. dubia***
Hidden inflorescences in axils of sheaths absent 4
4. Spikelets one-flowered **L. neesii**
Spikelets two- or more-flowered 5
5. Ligule apex (undamaged) attenuate, mostly 5 mm or more long 6
Ligule apex (undamaged) truncate, mostly shorter than 5 mm (except
L. southwoodii and *L. ligulata*) 8
6. Lowermost panicle branches not exerted at maturity; uppermost leaf blade
often exceeding length of panicle; lower portion of leaf sheaths often
mottled purple; lemma often smoky white at maturity with a darker area
covering the caryopsis; marginal hairs of lemma often strongly divergent
at maturity **L. fusca** subsp. **muelleri**
Lowermost panicle branches exerted at maturity; uppermost leaf blade
exceeding length of panicle; lower portion of leaf sheaths usually not

- mottled purple; lemma colour various, but generally not smoky white with a darker area; marginal hairs of lemma not strongly divergent at maturity 7
7. Lemma apex obtuse to truncate, often notched and mucronate; lemma dark green or lead coloured; panicles generally completely exerted from sheaths, narrowly elliptic to elliptic in profile; panicle branches held at greater than 45° angle, often greater than 30 branches in number; anthers usually less than 0.5 mm long **L. fusca** subsp. **uninervia***
 Lemma apex usually acute or acuminate, notched or not, mucronate or not; lemma generally not dark green or lead coloured; panicles sometimes not completely exerted, often broader than elliptic in profile; panicle branches sometimes held at less than 45° angle, frequently fewer than 30 branches in number; anthers usually 0.5–2.5 mm long **L. fusca** subsp. **fusca**
8. Panicle apex erect; mature panicle branches (10-) 15–30 cm long and divergent or reflexed; spikelets mostly distant **L. divaricatissima**
 Panicle apex usually somewhat nodding; mature panicle branches mostly less than 15 cm long, the branches only rarely divergent or reflexed; spikelets generally somewhat overlapping 9
9. Leaf sheaths with tubercle-based pilose hairs 10
 Leaf sheaths lacking tubercle-based pilose hairs 14
10. Leaf blades covered with sericeous or tomentose hairs; lower half of lateral nerves of lemma densely sericeous, the hairs increasingly divergent at maturity **L. decipiens** subsp. **peacockii**
 Leaf blades glabrous; lower half of lateral nerves of lemma hairy or not, but not with widely divergent hairs 11
11. Plants over 100 cm tall; hairs on leaf sheaths more or less dense and occurring throughout sheath; ligule apex sometimes notched at the middle **L. southwoodii**
 Plants (in Australia) mostly under 100 cm tall; hairs on leaf sheaths erratic, often most dense near sheath apex; ligule apex not clearly notched at the middle 12
12. Culms wiry; panicle branches generally naked along lowest 2 mm; leaf blades generally lacking a distinct midvein on upper surface (or, if so, only occurring at very base) **L. decipiens** subsp. **asthenes** (formerly known as **L. ciliolata**)
 Culms not wiry; panicle branches bearing one or more spikelets along lowest 2 mm; leaf blades with a distinct midvein on upper surface 13
13. Caryopsis with a shallow groove and somewhat laterally compressed, the apex often broadly acute; lower lemma mostly more than 1.3 mm long, mostly glabrous between midnerve and lateral nerves
 **L. panicea** subsp. **brachiata*** (formerly known as **L. mucronata**)
 Caryopsis lacking shallow groove and mostly terete in cross section, the

apex obtuse but never acute; lower lemma mostly less than 1.2 mm long, glabrous or hairy between midnerve and lateral nerves

..... **L. panicea** subsp. **panicea***

14. Plants perennial; ligules 0.9–1.7 mm long, apex erose but not notched near centre..... **L. decipiens** subsp. **decipiens**

Plants annual; ligules 4.2–7 mm long, sometimes with a central notch at the

apex **L. ligulata**

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Fig. 1. *Leptochloa fusca* subsp. *uninervia* (J. Presl) N.Snow: *a*, spikelets; *b* and *c*, floret, showing palea and the somewhat truncated lemma apex, the marginal nerves pubescent below; *d*, habit, *e*, grain, *f*, leaf sheath and the ligule (shown as bilobed; typically it is attenuate in undamaged condition). Reproduced with permission of the University of California Press from Mason (1957)

Notes on *Acacia* (Leguminosae: Mimosoideae) chiefly from northern Australia

Les Pedley

Summary

Pedley, Les (1999). Notes on *Acacia* (Leguminosae: Mimosoideae) chiefly from northern Australia. *Austrobaileya* 5(2): 307–321. Species are referred to sections recognised by Pedley (1978). *Acacia* *Abbatiana*, *A. arbiana*, *A. barakulensis*, *A. hendersonii*, *A. rubricola* (sect. *Phyllodineae*), *A. argyrotricha*, *A. johannis*, *A. convallium* (sect. *Plurinerves*), *A. abbatiana*, *A. burdekensis*, *A. faucium*, *A. filipes*, *A. fodinalis*, *A. lacertensis*, *A. proiantha*, *A. scopularum* and *A. solenota* (sect. *Juliflorae*) are described as new. *A. tingoorensis* nom. et stat. nov. is based on *A. longispicata* subsp. *velutina* Pedley. Notes on affinities, distributions and habitats of all species are given. Variation within *A. leiocalyx* (Domin) Pedley is discussed and a wide area of intergrade between *A. fodinalis* and *A. cretata* Pedley is postulated.

Keywords: *Acacia* – Australia; Queensland; Northern Territory.

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Introduction

With the approaching treatment of *Acacia* in Volumes 11A & 11B of the *Flora of Australia* it has become necessary to validate names of some species from Queensland and the Northern Territory included there, and some others that will not be included. Several of the species are closely related to *A. leiocalyx* (Domin) Pedley and variation within that species is discussed. The species are referred to sections according to the classification of Pedley (1978). Other species described here were recognised as distinct after editing of the two volumes of the Flora began and therefore cannot be included in it. These species are indicated by an asterisk (*). In the Flora, for the most part, they are included in rather wide circumscriptions of other species.

***Acacia* sect. *Phyllodineae* DC., Prodr. 2: 448 (1825).**

***Acacia arbiana* Pedley, sp. nov. ex affinitate *A. confertae* A. Cunn. ex Benth. et specierum affinium distinguenda phyllodiis distincte mucronulatis, angustioribus, elongatoribus, floribus aliquantum grandioribus corollae lobis longioribus praeditis. **Typus:** Queensland. LEICHHARDT DISTRICT: Ropers**

Peak, 22°52'S 148°13'E, alt. 780 m, 23 August 1990, P.I. Forster PIF7209 (holo: BRI; iso: AD, BRI, CANB, DNA, K, MEL, MO, NSW, PERTH, PRE, Z).

Acacia sp. (Ropers Peak P.I. Forster PIF7209) (Pedley 1997).

Spreading shrub to 1.5 m tall with black stems; branchlets, hidden by phyllodes, glabrous or with scattered loosely appressed hairs, ribbed by decurrent bases of phyllodes. Phyllodes linear, straight or slightly curved, narrowed into a longish curved mucro, crowded, spirally arranged, sometimes in pseudo-whorls, 8–16 mm long, 0.6–0.8 mm wide, thick without obvious nerves, narrowed into a longish curved mucro, with sparse, loose, \pm appressed hairs, c. 0.6 mm long, particularly on abaxial margin when young, glabrescent, apparently exstipulate but with minute red-brown trichomes in stipular position; pulvinus c. 0.5 mm long. Heads of 24–30 flowers on single axillary peduncles 8–10 mm long, projecting beyond the foliage, peduncle occasionally with 1 or 2 bracts below the head. Flowers 5-merous, subtended by bracteoles as long as the calyx with thick oblique pubescent lamina as long as the claw; calyx c. 1 mm long, lobes about one-third of total length, ciliate, often with a stouter brown trichome at the tip; petals obovate, c. 2

mm long, united to about the middle, glabrous; stamens c. 5 mm long; ovary glabrous. Pods similar to those of *A. conferta*, up to 4.5 cm long, 10–14 mm wide, valves rather membranous, finely reticulately veined, somewhat glaucous, convex over the seeds; seeds transverse, mature ones not seen.

Specimens (all BRI): Queensland. LEICHHARDT DISTRICT: Ropers Peak, May 1987, *Bean* 569 & Aug 1987, *Bean* 630; Scotts Peak, 22°51'S 148°13'E, alt. 570 m, Jun 1951, *Everist* 4427; Peak Range, c. 30 km SW of Dysart, Jan 1981, *Podlich* s.n. (AQ 348047).

Distribution and habitat: The species is confined to Ropers and Scotts Peak and perhaps other peaks of the Peak Range, east of Clermont. It is recorded from trachyte outcrops where it is a component of heath-like vegetation with *Phebalium glandulosum* Hook., *Corymbia trachyphloia* (F.Muell.) K.D. Hill & L.A.S. Johnson, *Bertya pedicellata* F.Muell., *Acacia gnidium* Benth., *Dodonaea filifolia* Hook., *Callistemon* sp. and *Zieria aspalathoides* A. Cunn. ex Benth.

Affinities: *Acacia arbiana* is close to *A. conferta*, but its phyllodes are more crowded, longer, narrower and distinctly mucronulate with long loosely appressed hairs, and it also lacks stipules. Its phyllodes resemble those of *A. gittinsii* which has spreading hairs on the stems, some heads in racemes and longitudinal seeds.

Etymology: The specific epithet is derived from the initial letters of the names of Mr A.R. (Tony) Bean whose flowering specimens collected in 1987 clearly indicated the species to be undescribed.

***Acacia barakulensis** Pedley, sp. nov. affinis *A. burbridgeae* Pedley a qua ramulosorum pilis aliquantum sparsioribus brevioribusque, phyllodiis brevioribus apice mucrone obliquiore pulvino 0.5–1 mm longo, plerumque brevioribus nervis marginalibus minus prominentibus ornatis, capitulis in pedunculis longioribus differt. **Typus:** Queensland. DARLING DOWNS DISTRICT: Barakula State Forest, 26°26'S 150°31'E, 18 August 1971, *L.A.Nielsen* 15 (holo: BRI).

Acacia barakulensis Pedley ex Lithgow, 60 Wattles of the Chinchilla and Murilla

Shires: 46 t.32 (1997), nom. invalid., no Latin diagnosis or description.

Acacia sp. (Barakula L.A. Nielsen 15) (Pedley 1997).

Shrub to c. 2 m high; branchlets brown, resinous, ribbed, sparsely pubescent; stipules setaceous, 0.3–0.6 mm long, persistent. Phyllodes sometimes in pseudowhorls, borne on short projections from ribs of branchlets, terete or somewhat laterally compressed, linear, ± straight, 10–22(–28) mm long, 0.6–1 mm thick, somewhat irregularly tuberculate with a few hairs, an inconspicuous yellowish nerve on ab- and adaxial surfaces with (when dry), a distinct lateral furrow between them and usually some obscure longitudinal folds; mucro oblique (sometimes perpendicular), 0.1–0.3 mm long; pulvinus 0.5–1 mm long; a single minute gland behind the mucro. Heads c. 9 mm diam. of (20–)25–35 flowers on ebracteate peduncles 6–10 mm long, single in the upper axils. Flowers 5-merous; calyx 0.7–0.8 mm long with wide obtuse lobes 0.2–0.3 mm long, a few short hairs at their tips; corolla 1.7–1.8 mm long, lobed to the middle, glabrous; stamens c. 4 mm long; ovary glabrous. Pods linear, ± straight, slightly contacted between the seeds and slightly convex over them, to c. 40 mm long, 4 mm wide, valves rather chartaceous, brown, resinous, reticulately nerved, marginal nerves prominent. Seeds longitudinal, 3.7–4.2 mm long, 2–2.4 mm wide, brown; areole darker, large; pleurogram constricted but open; funicle filiform, creamy yellow, thickened into a clavate aril. *Wajie Wattle*.

Selected specimens (all BRI): Queensland. DARLING DOWNS DISTRICT: 16–24 km N of Miles, Jul 1980, *Hando* 143; Woorjie [sic] flower area, Panda Lane, c. 30 miles [48 km] NW of Barakula Forestry Station, Aug 1981 (flowers) & Nov 1981 (pods), *Lithgow* 913; S.F.R. 16 *Malcolm*, N of Chinchilla, in 1958, *Cameron* QFD59/84.

Distribution and habitat: The species occurs only in the Barakula State Forest north of Chinchilla on sandy soils in eucalypt communities. It flowers August–September and pods have been collected in November.

Affinities: The nearest relative of *A. barakulensis* is *A. burbridgeae* but it is distinguished by its shorter phyllodes with

usually more oblique mucro and its heads on longer peduncles.

Etymology: The specific epithet is derived from Barakula the only known locality of occurrence of the species.

****Acacia hendersonii*** Pedley, **sp. nov.** ab *A. johnsonii* Pedley ramulis glabris phyllodiis juventate midnervo translucente ornatis in pulvinum brevem abrupte contractis mucrone minori praeditis, capitulis in pedunculis longioribus portatis differt; ab *A. resinicostata* Pedley phyllodiis pulvino brevi praeditis (non sessilibus) tenuioribus longioribusque differt. **Typus:** Queensland. LEICHHARDT DISTRICT: Blackdown Tableland c. 32 km SE of Blackwater, 23°50'S 149°05'E, alt. 600 m, 11 September 1971, R.J. Henderson, L. Durrington & P.R. Sharpe H1199 (holo: BRI).

Acacia sp. (Blackdown Tableland R.J. Henderson+ H1199) (Pedley 1997).

Spreading, much-branched shrub to 3 m tall; branchlets slender, resinous, glabrous, prominently ribbed, the ribs tuberculate; stipules subulate, 0.8–1 mm long, persistent. Phyllodes flat but thick, linear, straight or slightly decurved at apex or distinctly sigmoid, (6–)12–22 mm long, 0.7–1.1 mm wide, (8–)15–22 times longer than wide, glabrous, one vein prominent on each face, yellow and translucent on young (dark) phyllodes, raised and opaque on older ones, margins thickened, a distinct narrow longitudinal depression between midrib and margins on dried phyllodes; a short oblique mucro at apex; abruptly narrowed into pulvinus 0.2–0.5 mm long; a small gland up to 1 mm from base and a second smaller one at apex behind mucro. Heads of 30–35 flowers on ebracteate peduncles 9–15 mm long, single in upper axils; bracteoles spatulate, c. 1.2 mm long. Flowers 5-merous; calyx glabrous, c. 1.2 mm long, lobed to c. 1/3 length; corolla glabrous, 1.7–2.2 mm long, lobed to middle; stamens c. 3 mm long; ovary glabrous or minutely papillose towards top. Pod not seen.

Other specimens (all BRI): Queensland. LEICHHARDT DISTRICT: Blackdown Tableland, Aug 1966, *Gittins* 1184; ditto, Aug 1973, *Trapnell & Williams* 40; ditto, Sep 1971,

Henderson et al. H1077; Blackdown Tableland, 23°48'S 149°08'E, Sep 1988, *J.G. Simmons & M.H. Simmons* 2058.

Distribution and habitat: The species is confined to Blackdown Tableland, an isolated sandstone plateau with an interesting flora, including the endemic, or near-endemic, species *Acacia gittinsii* Pedley, *A. storyi* Tindale, *Corymbia bunites* (Brooker & A.R.Bean) K.D. Hill & L.A.S. Johnson, *Eucalyptus mensalis* L.A.S. Johnson & K.D. Hill and *E. sphaerocarpa* L.A.S. Johnson & Blaxell.

Affinities: *Acacia hendersonii* is one of a group of closely interrelated species that includes *A. barakulensis*, *A. burbridgeae* Pedley, *A. johnsonii*, *A. pilligaensis* Maiden, *A. resinicostata* and *A. rubricola* Pedley. It most closely resembles *A. johnsonii* but differs in having glabrous branchlets, phyllodes with translucent midribs when young, abruptly contracted into a short pulvinus, with a smaller mucro and heads borne on longer peduncles. It also has some affinity with *A. resinicostata* but differs in its finer and longer phyllodes which are not sessile but have pulvinuses 0.2–0.5 mm long.

Etymology: The specific epithet honours my friend and colleague Mr R.J.F. Henderson who not only was joint collector of the type on the first organised expedition to collect plants of the Blackdown Tableland, but also a noted systematist specialising in Liliaceae (sensu latissimo) (for example, Henderson 1987).

****Acacia rubricola*** Pedley, **sp. nov.** affinis *A. johnsonii* Pedley a qua phyllodiis vix pubescentibus minus crassis plerumque longioribus midnervo translucenti flavido ornatis, ramulorum pilis aliquantum brevioribus, leguminibus saepe angustioribus differt. **Typus:** Queensland. BURNETT DISTRICT: 6.7 km along Gurgeena Plateau road, 25°29'S 151°23'E, 23 August 1989, *P.I. Forster* PIF5650 (holo: BRI; iso (n.v.): CANB, MEL, PERTH).

Heavily foliated, much branched shrub to 2 m high; branchlets ribbed, with phyllodes borne on projections of ribs, resinous,

hispidulous with stiff straight hairs 0.1–0.2 mm long; stipules narrowly triangular, c. 0.5 mm long. Phyllodes flat, linear, straight or slightly sigmoid, narrowed from about the middle to base, 20–43 mm long, 1–1.8(–2.1) mm wide, 13–30 times longer than wide, a single translucent yellow longitudinal nerve prominent on each face, with additional obscure longitudinal folds when dry, marginal nerves irregularly sparsely tuberculate, covered with translucent resin and with a few hairs at and near base when young; gland at base small with thick yellowish rim, a second smaller gland behind mucro; mucro c. 0.5 mm long; pulvinus c. 1 mm long. Heads c. 9 mm diam., of 20–35 flowers on single yellow resinous peduncles 6–8 mm long in the upper axils; peduncle without basal bract but occasionally a bract or flower at about middle of peduncle; bracteoles spatulate, incurved, c. 0.8 mm long. Flowers 5-merous; calyx 0.7–0.9 mm long, divided to about the middle into wide, obtuse lobes, glabrous except for a few minute trichomes at apex of lobes; corolla 1.5–1.7 mm long glabrous; stamens c. 4 mm long; ovary glabrous or with a few hairs at base of style. Pods linear, dark to c. 40 mm long, 2.5 mm wide, dark brown; valves rather chartaceous, raised over seeds. Seeds 3.7–4.5 mm long, 1.6–2 mm wide, longitudinal; areole large, pleurogram open; funicle fine, folded and thickened into cream-coloured clavate aril.

Other specimens (all BRI): Queensland. BURNETT DISTRICT: Binjour Plateau, near Gayndah, 25°28'S 151°23'E, Oct 1987, *Bean* 673; Mundauran Pocket, Gurgeena Plateau, 25°28'S 151°23'E, Jan 1990, *Forster* PIF6174; State Forest Reserve 130, 2 km NW of Nantglyn, 25°31'S 151°21'E, Sep 1989, *Forster* PIF5734 & *Bean*; Gurgeena Quarry, Aug 1988, *J.G. Simmonds* & *M.H. Simmonds* 2017.

Distribution and habitat: The species is restricted to the Binjour Plateau near Gayndah where it occurs on red loamy soil in eucalypt open-forest or in heath. It flowers from mid-August to September and a fruiting specimen has been collected in January.

Affinities: *Acacia rubricola* is closely related to *A. johnsonii* and duplicates have been distributed under that name. It differs

however in having longer, less pubescent, somewhat resinous phyllodes with quite conspicuous yellow translucent midnerves and branchlets with shorter hairs, and narrower pods, though I have seen few mature pods of either *A. johnsonii* or *A. rubricola*.

Etymology: The specific epithet is derived from Latin *rubrica*, red earth, and *-cola*, inhabitant, an allusion to the occurrence of the species on red soils.

Acacia sect. **Plurinerves** (Benth.) Maiden & Betche, Census Pl. NSW 93 (1916)

Acacia argyrotrema Pedley, **sp. nov.** affinis *A. rigenti* A. Cunn. ex G. Don, a qua ramulis angularibus non costatis, phyllodiis saepe latioribus, capitulis florum amplioribus in pedunculis parum longioribus portatis, leguminibus plerumque angustioribus et imprimis indumento pilorum 0.5 mm longorum in ramulis, phyllodiis juvenibus (remanenti in frustillis in phyllodiis veteribus), pedunculis leguminibusque differt. **Typus:** Queensland. DARLING DOWNS DISTRICT: Bracker State Forest, S of Inglewood, 28°36'S 151°02'E, 16 September 1989, *A.R. Bean* 1115 (holo: BRI).

Acacia sp. (Inglewood A.R. Bean 1115) (Pedley 1997).

Shrub to c. 2 m tall, much branched from the base; bark smooth, grey to reddish brown; branchlets angular with dense appressed brown hairs, becoming grey with age, 0.5 mm long; young foliage brownish. Phyllodes linear, flattened, straight or slightly falcate, rather thick, 10–15 cm long, 1–1.8 mm wide, with indumentum of appressed brown hairs when young, glabrescent or hairs becoming white and retained in patches or along midline; mucronulate with usually curved brown mucro 1–2 mm long; gland at base of phyllode; pulvinus stout, c. 1 mm long, usually with appressed indumentum of stems. Heads slightly elongate, deep yellow, of 30–40 flowers in pairs in the upper axils; peduncles 2–2.5 mm long, pubescent, a short stout axis

between them. Flowers 5-merous, each subtended by a concave curved bracteole c. 1.3 mm long; calyx rather stout, obconic c. 1 mm long, lobed to about the middle, the tube with dense hyaline hairs particularly in the upper half, lobes ciliolate; corolla glabrous, c. 1.5 mm long, c. $\frac{1}{3}$ lobed, midrib in lower parts of lobes only; stamens 3–4 mm long; ovary glabrous. Pods linear, to 7.5 cm long, c. 2.5 mm wide, somewhat apiculate, with c. 8 seeds; valves coriaceous, brown, raised over the seeds, sparingly veined, with patchy indumentum of silvery appressed hairs c. 0.5 mm long. Seeds longitudinal, oblongoid, 3–4 mm long, 1.7–2 mm across; pleurogram \pm distinct, open; areole narrowly oblong; funicle folded and thickened into cupular aril.

Specimens (all BRI, all from type locality): Apr 1989, *Bean* 1023 & *Ballingall* 2542; Aug 1990, *Ballingall* 2579; Dec 1990, *Bean* 2735; s.d., *Ballingall* 2683.

Distribution and habitat: The species is known only from the type locality where it occurs on sandy soil in eucalypt woodland.

Affinities: *Acacia argyrotricha* resembles *A. rigens* but differs notably in the appressed hairs of the branchlets and young phyllodes; the indumentum is often retained in patches on and along the mid-line of old phyllodes. Its flower-heads are larger and borne on longer peduncles.

Etymology: The epithet is from Greek, *argyros*, silvery, and *trichos*, hair, a reference to the silvery indumentum particularly of the pods.

****Acacia johannis* Pedley, sp. nov.** ex affinitate *A. armillatae* (Pedley) Pedley, *A. legnotae* Pedley, *A. ommatospermae* (Pedley) Pedley; a tribus omnibus phyllodiis elongatioribus, pedunculis filiformibus, leguminibus angustioribus, ab *A. armillata* phyllodiis angustioribus nervis prominentibus longitudinalibus paucioribus pedunculis longioribus, leguminiis valvis super semina elevatis, seminibus parvioribus, ab *A. legnota* phyllodiis elongatioribus angustioribus nervis longitudinalibus paucioribus leguminiis valvis super semina elevatis, ab *A. ommatosperma* phyllodiis apice non latissimis, pedunculis longioribus,

pleurogrammate non prominenti differt.

Typus: Queensland. COOK DISTRICT: Mt Mulligan, 16°54'S 144°51'E, alt. 740 m, 13 April 1990, *J.R. Clarkson* 8217 (holo: BRI; iso: K, MBA, MEL, MO, QRS).

Acacia sp. (Mt Mulligan J.R. Clarkson 8217) (Pedley 1997).

Shrub to 2 m tall; bark smooth, grey; branchlets glabrous, reddish brown, ribbed, lenticellate. Phyllodes glabrous, narrowly elliptic, tapering gradually to base and apex, markedly falcate, 14–18 cm long, 5–10 mm wide, 15–30 times as long as wide; glabrous; 3 or occasionally 4 longitudinal nerves prominent, secondary nerves forming open anastomoses between them; acute with a callus point; gland \pm prominent on margin at base; pulvinus 1.5–2 mm long. Heads of c. 50 flowers, lemon-yellow, on glabrous filiform peduncles 14–20 mm long, arising from a brachyblastic axis c. 1 mm long at anthesis; axes usually two to each axil occasionally growing out into leafy shoots; bracteoles with a thick peltate shortly pubescent lamina almost perpendicular to the claw, about as long as the calyx. Flowers 5-merous; calyx divided almost to the base into narrow ciliolate spatulate lobes c. 1.5 mm long, the apex thickened; corolla deeply divided into ovate lobes, 1.8–2 mm long, glabrous; stamens 3–4 mm long; ovary glabrous. Pods shortly stipitate, linear, straight, dehiscent, the valves chartaceous, constricted between the seeds and raised over them, alternately on each valve, 7–10 cm long, 4 mm wide at widest part, 2–3 mm at isthmuses, glabrous. Seeds (up to 11 per pod), longitudinally arranged, dark brown, depressed ellipsoidal, c. 3.5 mm \times 2.5 mm, pleurogram obscure, closed; funicle thickened forming a small clavate aril.

Specimens: Queensland. COOK DISTRICT: Mt Pinnacle, SSW of Dimbulah, 17°14'S 145°03'E, Jan 1993, *Bean* 5578 & *Forster* (BRI); 3.3 km, S of the crossing of Shepherd Creek on Maytown track, 15°48'S 144°16'E, Jun 1992, *Clarkson* 9615 & *Neldner* (BRI, MBA); Mt Mulligan, 16°52'S 144°51'E, alt. 700 m, Apr 1985, *Clarkson* 5805 (BRI, K, MBA, MEL, NSW, PERTH) & Apr 1987, *Clarkson* 6927 (BRI, K, MBA, MEL, NSW, PERTH, QRS).

Distribution and habitat: The species is restricted to north-eastern Queensland where

it is common on Mt Mulligan. It occurs on rock outcrops and pavements and in shallow rocky soils derived from sandstone, and is common in places, forming thickets.

Affinities: *Acacia johannis* belongs to what has been termed the Oligoneura group of *Racosperma* (Pedley 1987), equivalent to the Oligoneurae group of *Acacia* (Pedley 1978). It is probably most closely related to *Acacia armillata*, *A. legnota* and *A. ommatosperma*. It differs from *A. armillata* in its more elongate phyllodes with fewer prominent longitudinal nerves, longer peduncles and narrower pods raised over the somewhat smaller seeds; from *A. legnota* in its narrower, more elongate phyllodes with fewer longitudinal nerves, filiform peduncles and narrower pods raised over the seeds; and from *A. ommatosperma* in its less elongate phyllodes not widest near the tip, shorter peduncles and narrower pods.

Etymology: The epithet is derived from the Latin, *Johannes*, John. The species is named in honour of John R. Clarkson (MBA) whose work in far northern Queensland in the last 15 years has significantly increased scientific knowledge of plant species and communities of the region.

***Acacia convallium* Pedley, sp. nov.** *affinis A. sericatae* Cunn. ex Benth. et *A. platycarpae* F. Muell.; a illa non denso indumento pilorum brevium manifeste stellatorum in phyllodiis ramulis pedunculisque habenti; a hac areolis nervorum anastomantium phyllodiorum majoribus elongationibusque, plerumque ramulis pubescentibus non glaucis, pluribus capitulis florum in quoque fasciculo, ab utraque phyllodiis non latissimis supra medium aliquantum acutis differt. **Typus:** Northern Territory. East Alligator River, 12°47'S 133°23'E, 18 July 1972, *N.B. Byrnes* 2750 (holo: BRI; iso (n. v.): CANB, DNA, K, NSW).

Spindly shrub to 5 m tall; branchlets terete with sparse to dense felty indumentum of hairs to 0.2 mm long, sometimes becoming glabrous, or rarely glabrous; stipules deltoid c. 1 mm long. Phyllodes ovate, falcate, 9–17.5 cm long, 1.2–4 cm wide, 3.5–8.5 times

longer than wide; with sparse indumentum of weak spreading hairs c. 0.15 mm long, hairs sometimes confined to the base; upper margin often undulate, with two, three or rarely four longitudinal nerves prominent, only one reaching the apex, all running together into the lower margin at the base, oblique secondary nerves forming a reticulum; tapering to a callus point; glands 2–4(–5) on upper margin, small, sometimes projecting, absent from the base; pulvinus 5–10 mm long, with indumentum of branchlets. Inflorescence of up to 7 fascicles of pedunculate heads at anthesis at the one time, on indeterminate axes in the upper axils, the axis up to 10 cm long, with indumentum of branchlets, with immature fascicles crowded at apex; fascicles subtended by a deciduous deltoid bract c. 1 mm long, of 4–6 slender peduncles 12–17(–23) mm long, with indumentum of spreading hairs c. 0.25 mm long, the hairs sometimes confined to base. Heads of c. 30 flowers each subtended by a clawed bracteole, the claw as long as the calyx, the lamina c. 0.5 mm long, obliquely ovate, acute. Flowers 5-merous; calyx lobes free, spatulate, c. 1 mm long, with spreading hairs in upper half; corolla lobed to about the middle, c. 1.6 mm long, the lobes with spreading hairs; stamens c. 3.5 mm long, the filaments cohering in the lower half (especially in male flowers); ovary glabrous. Pods 7–11 cm long, 28–36 mm wide, with woody, glabrous, reticulately nerved valves, the margins forming a 'wing' 2.5–3.5 mm wide. Seeds 8–8.5 mm long, 5.3–6.2 mm wide, 3–3.5 mm thick, transverse, arranged in depressions in the material of the valves; areole large; pleurogram open, well defined; funicle c. 3 times folded and thickened into a stout aril forming a cap over the seed.

Specimens: Northern Territory. East Alligator River area, 12°41'S 133°08'E, *Dunlop* 3421 (BRI, DNA, K); 44 km SE of Oenpelli, 12°34'S 133°23'E, *Dunlop* 4926 (BRI, DNA); 14 km NE of Mann River Gorge, 12°39'S 134°08'E, *Leach & Dunlop* 1590 (BRI); Along road to Smith Point, 73.5 km NW of Murgarella, 11°20'S 132°20'E, *McDonald* 421 (BRI).

Distribution and habitat: The species is confined to a small area in the north of the Northern Territory where it usually occurs on sandstone, often in gorges.

Affinities: *Acacia convallium* is allied to *A. sericata* but lacks the stellate hairs so prominent on the phyllodes, branchlets and peduncles of that species, and more closely to *A. platycarpa* but the areoles among the anastomoses of the nerves of its phyllodes are larger and more elongate; its branchlets are usually pubescent, not pruinose; and it has more flower heads in each fascicle in the inflorescence. It differs from both in having somewhat acute phyllodes not widest above the middle. The cohesion of the lower part of the staminal filaments is most unusual in species of *Acacia*.

Etymology: The specific epithet is genitive plural of Latin *convallis*, a valley shut in on all sides, an allusion to the plant's habitat.

Acacia, sect. **Juliflorae** (Benth.) Maiden & Betche, Census Pl. NSW 95 (1916)

***Acacia abbatiana** Pedley, **sp. nov.** *A. graniticae* Maiden similis a qua cortice lamellato, phyllodiis aliquantum brevioribus, inflorescentiis multispicatis, floribus parvioribus (staminibus tantum c. 2.2 m longis) hinc spicis tenuioribus, calyce pilis arachnoideis oblecto, leguminibus brevioribus, seminibus parvioribus pleurogrammate U-formi ornatis differt. **Typus:** Queensland. SOUTH KENNEDY DISTRICT: Mt Abbot, 50 km W of Bowen, 20°06'S 147°46'E, alt. 800 m, 2 August 1992, *A.R.Bean* 4873 (holo: BRI; iso (n.v.): AD, BISH, HO, K, L, MEL, MO, NSW).

Acacia sp., (Mt Abbot A.R.Bean 4873) (Pedley 1997).

Shrub to c. 4 m tall, foliage confined to upper part of plant, lower part of stems bare; bark brown, lamellated (described by collector as 'fibrous'); branchlets pale brown, often with greyish overlay of dead epidermal cells, glabrous, angular. Phyllodes linear, straight, (70–)95–150 mm long, 1.6–3 mm wide, 40–65 times longer than wide, glabrous, with 13–19 parallel non-anastomosing longitudinal nerves, the midnerve slightly more prominent, marginal nerves somewhat thicker than rest, a straight or slightly oblique brown callus point at apex; small gland at base; pulvinus

not well defined. Spikes 8–9 mm long, c. 5 mm diam. at anthesis, rachis with scattered curled hairs; peduncles 1–2 mm long, borne in 2s and 3s on a minute axillary shoot, occasionally spikes becoming lateral as shoot elongates; bracteole c. 0.5 mm long, with oblique claw with long hairs on back. Flowers 5-merous; calyx 0.5–0.7 mm long, cupular, membranous, sinuately lobed, rather dense white arachnoid hairs and a few brown scales on lobes; corolla 1.3–1.5 mm long, glabrous, lobed to middle, lobes uninerved, strongly recurved; stamens 2–2.2 mm long; ovary with a few long stiff hairs towards the apex. Pods to 35 mm long, 2.5 mm wide with up to 8 seeds, pale brown with thick marginal nerves. Seeds longitudinal 2.4–3.2 mm long, 1.3–1.4 mm wide, dark with paler areole; pleurogram U-shaped; funicle pale, once folded, thickened into a small aril capping the seed.

Other specimens (all BRI): Queensland. SOUTH KENNEDY DISTRICT: Mt Abbot, 20°06'S 147°46'E, alt. 800m, Oct 1992, *Bean* 5196; Mt Abbot, 20°07'S 147°46'E, alt. 400m, Jul 1992, *Bean* 4753.

Distribution and habitat: The species is confined to Mt Abbot where it occurs in heathland on rather steep slopes on skeletal soils derived from granite. Flowering material was collected in August and fruiting in October.

Affinities: *Acacia abbatiana* is closely related to *A. granitica*, and was recorded as such by Bean (1994), but differs in having lamellated bark, somewhat shorter phyllodes, inflorescences of slender spikes on axillary shoots, smaller flowers (stamens to only 2.2 mm long) and calyx with dense arachnoid hairs and shorter pods with smaller seeds.

Etymology: The specific epithet is formed from Latin *abbas*, -itis, abbot, and the suffix -ana, indicating position: a reference to Mt Abbot, the only known locality for the species.

***Acacia burdekensis** Pedley **sp. nov.** affinis *A. leiocalyci* (Domin) Pedley a qua habitu arboris usque 9 m altae, phyllodiis forma similis eis *A. leptostachyae* Benth. plerumque elongatioribus, plerumque plus quam 6-plo longioribus quam latis, saepe angustioribus nervis multis

tenuibus parallelis vix anastomantibus ornatis differt. **Typus:** Queensland. NORTH KENNEDY DISTRICT: 8 miles [c. 13 km] W of Pentland, 19 June 1953, *M. Lazarides* 3543 (holo: BRI; iso: CANB (n.v.), PERTH).

Acacia sp. (Torrens Creek C.T. White 8725) (Pedley 1997).

Tree to 9 m tall; bark dark, rough, furrowed or tending to form hard rectangular flakes; branchlets reddish, angular, scurfy, resinous (as are young phyllodes); stipules deltoid, 0.5–0.8 mm long, caducous. Phyllodes somewhat crowded towards the ends of the branches (internodes short), straight to strongly falcate, widest below the middle, (7)9.5–14.5 cm long, 7–18 mm wide, 6–11(–15.5) times longer than wide; glabrous; 2 or 3 longitudinal nerves more prominent than the rest, secondary nerves parallel, rather crowded (30–40 per cm) with some oblique nerves forming anastomoses; tapering to an acute callus point at the apex; gland basal, prominent with distinct swelling and prominent orifice; abruptly contracted to a reddish pulvinus 4–6 mm long. Spikes moderately dense, 25–40(–60) mm long, rachis glabrous, on peduncles 7–12 mm long in pairs in upper axils; bracteoles rather stout 0.4 mm long, caducous. Flowers 5-merous; calyx cupular 0.5–0.75 mm long, lobes 0.1–0.2 mm long, glabrous except for a few minute trichomes on margins of lobes; corolla (1.5–)1.7–2 mm long, glabrous, lobes c. 1 mm long, strongly reflexed; stamens c. 4 mm long; ovary white-hirsute. Pods not seen.

Specimens (all BRI): Queensland. NORTH KENNEDY DISTRICT: Greenvale Nickel Mine turn off, 18°53'S 144°53'E, Apr 1991, *Batianoff* GV9104106 & *Franks*; 10 km NE of 'Valley of Lagoons' H.S., 18°38'S 145°12'S May 1971, *Blaxell* 503 (ex NSW); Burra Range, Apr 1984, *Brown* 22; Charters Towers - Clermont Road 42 miles [67 km] from Charters Towers, May 1960, *Johnson* 1854; 50 km N of Cape River between Charters Towers and Clermont, Jun 1994, *Essex* s.n. (AQ 627982); 3 km W of Noname Hill, Valley of Lagoons; 18°44'S 145°21'E, Aug 1988, *Mockett* s.n. (AQ 476295); Torrens Creek, Mar 1933, *White* 8725.

Distribution and habitat: The species is largely confined to the northern part of the Burdekin River basin between about 18°30'S and 21°S

where it occurs on stony and sandy soils on hillsides and on creek banks.

Affinities: *Acacia burdekensis* has been previously included in a rather heterogeneous *A. leiocalyx* but differs in being a moderately large tree with rather elongate phyllodes similar in shape to those of *A. leptostachya* with fine crowded, only sparingly anastomosing, secondary nerves.

Etymology: The epithet is a contraction of 'burdekin' and Latin *-ensis* indicating the occurrence of the species largely within the northern parts of the basin of the Burdekin River.

****Acacia faucium* Pedley, sp. nov.** ramulis valde angularibus, phyllodiis pulvino brevi nervis longitudinalibus majoribus basin versus confluentibus *A. leiocalyci* (Domin) Pedley similis autem phyllodiis plerumque longioribus chartaceioribus nervis secundariis pluribus, spicis brevioribus, calyce plerumque pilis hyalinis aliquot basi, valvis leguminis cartilagineis differt. **Typus:** Queensland. NORTH KENNEDY DISTRICT: Bertya Creek, W of "Warang", White Mountains National Park, 20°27'S 144°46'E, 21 June 1992, *A.R.Bean* 4611 (holo:BRI).

Tree to 10 m tall; branchlets acutely angular, somewhat scurfy, with sparse minute (c. 0.1 mm long), appressed hairs on young plants, glabrescent; young growing tips brown; stipules deltoid c. 0.5 mm long, deciduous. Phyllodes straight or somewhat falcate, widest above the middle, 13.5–18 cm long, (16–)20–27 mm wide, 4.5–7.5(–9) times longer than wide; rather chartaceous in texture, glabrous or with sparse appressed hairs c. 0.1 mm long on young plants; 2 or 3 longitudinal nerves more prominent than the rest, confluent with each other near lower margin towards the base, secondary nerves rather crowded (20–25/cm) anastomosing; blunt at apex; gland prominent, basal; tapering into pulvinus 0.5–0.8 mm long. Spikes moderately dense, 35–55 mm long, rachis pruinose, on reddish peduncles 5–8 mm long in pairs in upper axils; bracteoles

c. 0.5 mm long, glabrous, the stipe somewhat longer than the oblique lamina. Flowers 5-merous; calyx rather broad, 0.5–0.8 mm long with obtuse lobes 0.1–0.2 mm long, glabrous or usually with a few spreading hyaline hairs towards the base; corolla 1.7–2 mm long, glabrous, lobed to about the middle, lobes uninerved, strongly reflexed; stamens c. 2.5 mm long; ovary hirsute with white hairs. Pods linear, \pm straight, to c. 8 cm long, 3 mm wide, with up to 12 seeds; valves brown-black, cartilaginous, glabrous, somewhat glaucous, obscurely longitudinally wrinkled, raised over seeds, marginal nerves thick, prominent, yellowish; seeds longitudinal, pale brown, 3.5–4 mm long, c. 2 mm wide; areole large; pleurogram not well defined, oblong, closed or almost so; funicle yellow, folded about 3 times and thickened to form cupular aril.

Selected specimens (all BRI): Queensland. NORTH KENNEDY DISTRICT: Torrens Creek Gorge, White Mountains, 20°28'S 144°55'E, Oct 1991, *Cumming* 11422; 'Warang' Holding, White Mountains, 37 km NNW of Torrens Creek, 20°29'S 144°48'E, Aug 1988, *Fell* DF1369; 88 km NE of Clermont, 22°09'S 148°08'E, Jun 1972, *McDonald* 556; 3 miles [c. 5 km] NE of 'New Twin Hills' H.S., Aug 1964, *Pedley* 1738 (ex CANB).

Distribution and habitat: The species is common in the headwaters of Torrens Creek in White Mountains where it occurs in gorges in sandstone. It also occurs in broken country farther south, about 100 km north of Clermont.

Affinities: *Acacia faucium* is closely allied to *A. leiocalyx* but has usually longer, more chartaceous phyllodes with more widely spaced secondary nerves, shorter spikes, usually a few hairs on the calyx and valves of the pod cartilaginous.

Etymology: The specific epithet is Latin, meaning 'of gorges' a reference to the habitat of the species at the type locality.

***Acacia filipes* Pedley, sp. nov.** non prope affinis ullae Australiae borealis speciei, phyllodiis teretibus, calycibus lobatis fere ad basem, leguminibus angustis semina parum obliqua pleurogrammatibus inapertis gerentibus, et praecipue pedunculis perlongis (35–45 mm longis)

notabilis. **Typus:** Northern Territory: 21 km N of Jim Jim Falls, near entrance to Deaf Adder Gorge, 13°15'S 132°51'E, 29 May 1980, *M. Lazarides* 9075 (holo: BRI; iso: (n.v.) CANB).

Spreading shrub to c. 1 m tall and 2 m wide; stems smooth, grey; branchlets slender, angular, ribbed, resinous. Phyllodes glabrous, terete (or drying somewhat angular); 8.5–15 cm long, 0.4–0.8 mm diam. with 8 parallel longitudinal nerves and a short oblique callus point; gland basal or up to 5 mm from the base, the phyllode usually slightly bent when gland not at the base; pulvinus 1–1.5 mm long. Spikes in pairs at base of rudimentary axillary shoot, 10–25 mm long on slender peduncles 35–45 mm long; bracteoles as long as the calyx, with a thickened peltate lamina. Flowers 5-merous; calyx glabrous, c. 0.7 mm long, divided almost to the base into oblong obtuse lobes; corolla 1–1.2 mm long, divided to about the middle; stamens c. 3 mm long; ovary glabrous. Pods flat, linear, 4–4.5 cm long, 2.5–3 mm wide; valves slightly resinous, rather woody with raised anastomosing nerves. Seeds (up to 8 per pod), longitudinally to slightly obliquely arranged, dark grey, c. 3 mm long, 1.5 mm wide; pleurogram closed; funicle straight, thickened into a cupular aril similar to that of *A. calyculata*.

Other specimen: Northern Territory. Deaf Adder Gorge, 13°05'S 132°51'E, Feb 1977, *Fox* 2564 (BRI, DNA).

Distribution and habitat: This is evidently a rare species confined to the vicinity of Deaf Adder Gorge where it occurs on the top of the sandstone escarpment.

Affinities: *Acacia filipes* is apparently not closely related to any other species. A combination of attributes (terete phyllodes, long filiform peduncles, deeply lobed calyx, pods with reticulately nerved valves and slightly oblique seeds with a closed pleurogram) sets it apart from all other species known to me. The Fox specimen has finer phyllodes than those of the type and came from a smaller plant but otherwise the two specimens are similar.

Etymology: The epithet is derived from Latin *fili*, thread and *pes*, foot, an allusion to the

long threadlike peduncles of the inflorescence.

***Acacia fodinalis** Pedley, **sp. nov.** affinis *A. leiocalyci* (Domin) Pedley a qua phyllodiis plerumque angustioribus elongatioribus (plus quam 7.5-plo longioribus quam latis), spicis in pedunculis longioribus, leguminibus angustioribus differt. **Typus:** Queensland. LEICHHARDT DISTRICT: Norwich Park mine, c. 22°40'S 148°20'E, 8 June 1983, J. Martin s.n. [AQ 349851] (holo: BRI).

Acacia sp. (Norwich Park J. Martin AQ 349851) (Pedley 1997).

Tree to 10 m tall with grey-brown coarsely fibrous fissured bark; branchlets reddish, sharply angular, resinous when young, sometimes slightly scurfy, becoming smooth; stipules deltoid, c. 1 mm long, caducous. Phyllodes slightly falcate, tapering equally to each end, 8.5–13 cm long, 8–15 mm wide, 7.5–15 times longer than wide; glabrous; 2 or 3 longitudinal nerves more prominent than the rest tending to run together near adaxial margin near base, secondary longitudinal nerves crowded (25–35 per cm), distinctly anastomosing; apex acute with a callus point; gland at, or within 1 mm of base, prominent, a distinct swelling of margin with a marked orifice. Spikes rather open, (25–)45–70 mm long, rachis glabrous and occasionally glaucous, on peduncles (5–)7–10(–13) mm long in 2s or 4s in upper axils; bracteoles c. 1 mm long, a narrow claw and oblique lamina with a few hairs, caducous. Flowers 5-merous; calyx cupular, glabrous or with a few hairs near the base, 0.5–0.8 mm long, lobes c. 0.1 mm long; corolla c. 1 mm long, glabrous, lobes strongly reflexed; stamens c. 2.5 mm long; ovary white hirsute. Pods linear, ± straight, to c. 45 mm long, 2.3–3 mm wide, dark brown, with marginal nerves yellow; raised over seeds and slightly constricted between them. Seeds longitudinal, light brown, c. 3.5 mm long, 1.7–2 mm wide; areole large, pale; pleurogram rectangular, open; funicle folded c. 3 times, thickened into yellow cupular aril.

Specimens (all BRI): Queensland. LEICHHARDT DISTRICT: 2 miles [c. 3 km] N of 'Logan Downs' Stn, Aug 1964, Adams 1263 (ex CANB); c. 8 km N of Dysart, Jun 1989,

Anderson 1011; Riverside coal project, 30 km NW of Moranbah, Aug 1981, Anon.; Lake Elphinstone, 21°33'S 148°13'E, Jul 1985, Champion 146; 17 miles [27 km] E of 'Pasha' homestead, Jul 1964, Pedley 1727A (ex CANB). SOUTH KENNEDY DISTRICT: Peak Downs Highway at top of Eton Range, 21°S 148°52'E, Champion 1341 & Ritchie.

Distribution and habitat: The species occurs in the upper part of the Isaacs River basin and adjacent part of the Belyando River basin where it occurs usually on sandy soils often associated with *Eucalyptus crebra*.

Affinities: *Acacia fodinalis* is closely related to *A. leiocalyx* but develops into a larger plant with usually narrower and more elongate phyllodes (more than 7.5 times longer than wide), spikes on longer peduncles, and narrower pods.

Etymology: The specific epithet is derived from Latin *fodina*, a pit or mine, and the suffix *-alis*, pertaining or belonging to, an allusion to the large collieries in the geographic range of the species.

Acacia lacertensis Pedley, **sp. nov.** prope affinis *A. tropicae* Tindale a qua phyllodiis angustioribus minus crassis plerumque 2-nervibus, pedunculis spicarum brevioribus, spicis brevioribus, probabiliter leguminibus longioribus angustioribusque semina parviora gerentibus differt. **Typus:** NORTHERN TERRITORY. Narbalek, 12°19'S 133°19'E, 30 August 1988, R. Hinz 51 (holo: BRI (2 sheets); iso (n.v.): AD, CANB, DNA, MEL, NSW, PERTH).

Slender tree with sparse canopy to 8 m tall; bark grey-brown; branchlets stout, angular, glabrous, pruinose; young tips dark. Stipules deltoid, c. 1 mm long, caducous. Phyllodes straight or somewhat sigmoid, attenuate at the base, 12.5–17(–20) cm long, 1–2(–2.5) cm wide, 6.5–12 times longer than wide, glabrous, rather thin in texture with fine, widely spaced (c. 0.5 mm apart in middle of phyllode) longitudinal nerves, two or occasionally three more prominent, these running together in middle of phyllode at its base; obtuse at the apex with a caducous callus; gland at base of phyllode not prominent; pulvinus 5–14 mm

long. Spikes golden-yellow (*Chippendale* NT 8094), in pairs at base of rudimentary shoot in upper axils, 4–5 cm long on peduncles 5–8 mm long. Flowers 5-merous; calyx 0.4–0.5 mm long, broadly cupular, lobed to about the middle, the lobes wide, obtuse, glabrous or fimbriate, with a few hairs towards base of the tube; corolla 1.4–1.6 mm long, lobed to about the middle, glabrous; stamens 3–4 mm long; ovary sparsely sericeous. Pods \pm straight, 8–9 cm long, 3.5 mm wide with up to 12 seeds; valves convex over the seeds, with prominent marginal nerves. Seeds obloid, 3.8–4.5 mm long, 1.7–2.3 mm wide; pleurogram open; areole oblong, 2.8–3.5 mm long, c. 1 mm wide; funicle thickened and folded, forming cupular aril beneath the seed.

Specimens: Northern Territory. East Alligator River, 12°47'S 133°23'E, Jul 1972, *Byrnes* 2751 (BRI, DNA); Narbalek, Cooper Creek, 12°19'S 133°19'E, *Hinz* 597 (BRI); Cooper Creek, 28 miles [45 km] N of Oenpelli, Jul 1962, *Chippendale* NT 8094 (BRI, DNA); 17.8 km along turn-off to Murgentella, Cooper Creek, 12°06'S 133°11'E, Sep 1987, *McDonald* MM 413. (BRI).

Distribution and habitat: The species has been recorded only from sandy banks of the East Alligator River and its tributary Cooper Creek.

Affinities: *Acacia lacertensis* and *A. tropica* are closely related. The most obvious differences between them are the texture of the phyllodes and the prominence of the nerves. The significance of the differences in pods and seeds is difficult to assess as only one fruiting specimen of *A. tropica* has been examined and the specimen is not a good representative of the species. It is George Creek, 18°15'S 137°16'E, 12 Sep 1967, *A. Nicholls* 733 (BRI; distributed from DNA as *Acacia* sp. aff. *A. gonoclada*). It has pods which are somewhat immature, about 60 mm long and 5 mm wide with dark valves with lighter nerve-like margins and longitudinal seeds. The single seed examined (not quite mature) is 4.8 mm long, 2.5 mm wide with a oblong areole; the pleurogram is pale and open, and the funicle thickened and folded to form a cupular aril beneath the seed.

Etymology: The specific epithet is derived from Latin *lacerta*, lizard and the suffix *-ensis* indicating place of origin: a rather indirect reference to the Alligator River. English

alligator is a corruption of the Spanish *el lagerta* which is derived from the Latin *lacerta*.

Acacia leiocalyx (Domin) Pedley, Contrib. Qld Herb. 15:10 (1974), *Austrobaileya* 1:179 (1978); *A. glaucescens* var. *leiocalyx* Domin, Bibliothec. Bot. 89:269 (1926).
Type: Queensland, prope Brisbane River, *Amalia Dietrich* 568 (ex museo Godeffroy *Hamburgensi* 5068) (lecto: PR527897, *vide* Pedley, 1974).

Acacia leiocalyx is widespread in subtropical Queensland from the coast west to about 147°E longitude and in north-eastern New South Wales. It is particularly common in south-eastern Queensland where it is sympatric with *A. concurrens* Pedley. It is conspicuous on coastal dunes but away from the coast it is less so. There it usually occurs on shallower soils on steeper slopes than does *A. concurrens*. Prior to 1974 the two were not formally distinguished and were both referred to as *A. cunninghamii* Hook.f., an illegitimate name. *A. leiocalyx* differs from *A. concurrens* in having smooth (not scurfy), sharply angular, often reddish branchlets, shorter pulvinuses and completely glabrous calyxes. It flowers earlier in the year than *A. concurrens*, though in some areas it may flower synchronously and hybrids between the two are suspected to occur in north-eastern New South Wales and on the northern outskirts of Brisbane. Populations of *A. leiocalyx* west of the Dividing Range often begin to flower earlier than populations east of the range at the same latitude and elevation, have longer periods of flowering and deeper yellow flowering spikes. Plants from the two regions are morphologically similar. *A. leiocalyx* subsp. *herveyensis* is distinguished from *A. leiocalyx* subsp. *leiocalyx* by its narrow phyllodes widest below the middle, long attenuate to the apex which is slightly thickened. The subspecies form mixed stands, particularly between Bundaberg and Maryborough, but subsp. *herveyensis* stands out, not only on account of its narrower phyllodes but also because it flowers later than subsp. *leiocalyx*. Some workers, for example Tame (1992) do not recognise subsp. *herveyensis*.

Plants from subcoastal regions north of the Tropic of Capricorn identified as *A. leiocalyx* have been a puzzle. Pedley (1978)

referred to a variant from 'a small area in central Queensland' with 'remarkably consistent narrower phyllodes'. Collections made since that time revealed that the situation is more complex than believed. Consideration of these more recent collections and re-appraisal of some old ones resulted in the recognition of *A. burdekensis*, *A. fodinalis* and *A. faucium*. The last is a distinctive species but the others are close to *A. leiocalyx*, distinguished from it in having more elongate, usually narrower phyllodes, often with more crowded secondary longitudinal nerves, longer pulvinuses, and at least some flowers in the inflorescence with a few erect hyaline hairs at the base of the calyx. Mature plants of both species are larger than those of *A. leiocalyx*. Though the distinctions between the two species and between them and *A. leiocalyx* are on occasions rather nebulous they do warrant recognition, if only in providing a basis for further studies, especially in the field. Such studies should also include *A. crassa* Pedley and *A. longispicata* Benth. which are sympatric with some of these species.

Even with the recognition of the species mentioned above, many collections, including those of the variant with narrow phyllodes originally noted, cannot be referred to any of the species. Having studied populations of them in the Emerald-Blackwater-Duaringa area, I consider these specimens represent intergrades between *Acacia cretata* Pedley and *A. fodinalis*. *A. cretata* on the Blackdown Tableland has stout angular pulverulent branchlets, large phyllodes abruptly contracted into short pulvinuses and long spikes. At lower altitudes along the northern edge of the Tableland, plants with more slender glaucous branchlets, somewhat smaller phyllodes tapering into longer pulvinuses, and shorter inflorescences occur. These may conveniently be considered *A. cretata*. Other plants, however, lack the extreme characters of *A. cretata* though angular glaucous branchlets invariably occur; these are considered to be the intergrades with *A. fodinalis*. The zone of intergradation is an arc some 80–100 km wide from the north-west to the north-east of Blackdown Tableland.

***Acacia proiantha* Pedley, sp. nov.** non arcte speciebus ceteris *Acaciae* sectionis *Juliflorae* affinis; phyllodiis 11–17.5 cm

longis, 1–1.5 mm latis nervum medium ceteris prominentiorem habientibus, floribus parvis petala c. 1 mm longa gerentibus, leguminibus aliquantum moniliformis valvis reticulatim nervatis, seminibus parvis c. 2.6 mm longis et 1.6 mm latis insignis. **Typus:** Northern Territory, c. 2.5 miles [4 km] SW of Mt Gilruth, 13°03'S 133°02'E, 28 February 1973, *M. Lazarides* 7938 (holo: BRI; iso (n.v.): CANB).

Erect spindly shrub with sparse canopy to c. 3 m tall; stems smooth, grey; branchlets angular, glabrous, slightly resinous; young tips also resinous. Phyllodes rather thick, linear, 11–17.5 cm long, 1–1.5 mm wide; glabrous; one longitudinal nerve forming a midrib, with 4–6 less prominent non-anastomosing nerves on each side of it; acute at the apex with a deciduous callus point; gland basal, inconspicuous; pulvinus 1.5–3 mm long. Spikes single at the base of a rudimentary axillary shoot, 15–20 mm long, on peduncles 4–6 mm long, the peduncle and axis somewhat resinous; bracteoles as long as the calyx, with a narrow claw and lamina peltate, thickened. Flowers 5-merous; calyx broadly cupular, somewhat resinous, 0.4–0.6 mm long, lobed to the middle, the lobes thick, obtuse, sometimes with a few marginal hairs; corolla 0.9–1.1 mm long, lobed to the middle, glabrous. Pods straight, linear acute at the tip, the valves rather thick with raised reticulate nerves, constricted between the seeds and raised over them, to 6.5 cm long, 2.5 mm wide at widest part, 1.5 mm wide at isthmuses, glabrous, slightly resinous. Seeds (8 per pod) longitudinally arranged, obloid, c. 2.6 mm long, 1.6 mm wide; areole pale, narrow, oblong; pleurogram obscure, open; funicle thickened into pale aril folded twice beneath the seed.

Specimens: Northern Territory, 3 miles [5 km] E of Jim Jim Falls, Jul 1972, *Byrnes* 2724 (BRI, DNA, K); Deaf Adder Gorge, 13°02'S 133°05'E, Feb 1977, *Fox* 2519 (BRI, DNA).

Distribution and habitat: The species is restricted to the northern part of the Northern Territory where it occurs on sandstone.

Affinities: *Acacia proiantha* is not closely related to any other species of *Acacia* sect. *Juliflorae*. It has long narrow phyllodes with one nerve more

prominent than the rest, forming a distinct midrib; its flowers are small with petals only about 1 mm long; and its pods are somewhat moniliform with small longitudinal seeds.

Etymology: The epithet is derived from Greek *prois*, early in the year, and *anthos*, a flower; an allusion to the February flowering of the species.

***Acacia scopularum* Pedley, sp. nov.** affinitatis incertae *A. spirorbi* subsp. *solandri* (Benth.) Pedley propter amplitudinem formamque phyllodiorum, spicas interruptas in pedunculo brevi primo adpectu simile, sed nervis longitudinalibus phyllodiorum non crebris, floribus 4-meris, petalis multo brevioribus, ovario glabro, leguminibus non torsivis differt. Arbor vel frutex usque 5 m altus. Phyllodia glabra linearia, parum falcata, 7–11 cm longa, 4.5–6 mm lata, 15–20-plo latis longiora; nervis longitudinalibus 8–14 late separatis aliquando anastomosantibus instructa; pulvinus 1.5–2.5 mm longus. Flores 4-meri; calyx 0.5 mm longus, non nisi leviter lobatus; corolla 1.5 mm longa; ovarium glabrum. Legumina linearia, leviter constricta inter semina et convexa super ea, usque 9 cm longa, 2 mm lata, valvis reticulatim nervatis et marginibus incrassatis praedita; seminia parva in longitudinem disposita. **Typus:** Northern Territory. ESE of Mudginbarry, 12°36'S 132°58'E, 19 February 1973, C.R. Dunlop 3313 (holo: BRI; iso (n.v.): CANB, DNA, MEL).

Tree or large shrub, branches sometimes sprawling, to 5 m high; bark rough, fissured; branchlets dark red, angular, glabrous; stipules minute or absent. Phyllodes narrow, lanceolate falcate, widest above the middle, 7–11 cm long, 4.5–6 mm wide, 15–20 times longer than wide, glabrous; a callus point, sometimes oblique at the apex; with 8–14 widely spaced (0.3–0.5 mm apart) longitudinal nerves, an occasional anastomose; gland at the base; pulvinus 1.5–2.5 mm long. Flowers in interrupted spikes 3.5–4.5 cm long in pairs, with a rudimentary axis between them, in the upper axils; rachis glabrous; peduncles 1.5–2 mm long. Flowers 4-merous; calyx 0.5 mm long, only shortly lobed, glabrous except for a few short hairs on

the lobes; corolla lobed to the level of the calyx, c. 1.5 mm long, lobes with a distinct midrib, strongly reflexed; stamens c. 2.5 mm long; ovary glabrous. Pods glabrous, linear, straight or slightly curved, with up to 15 seeds, 8–9 cm long, 2 mm wide, valves reticulately veined with thickened margins raised over the seeds. Seeds longitudinal obloid, 2–2.5 mm long, 1.5–1.7 mm wide; areole large, oblong; pleurogram conspicuous, open; funicle folded, thickened into small yellow cupular aril.

Specimens: Northern Territory. Radon Creek, Mt Brockman, 12°45'S 132°56'E, Dunlop 4679 (BRI, DNA); Little Nourlangie Rock, 12°51'S 132°50'E, Fox 2568 (BRI, DNA); Deaf Adder Gorge, 13°02'S 133°05'E, Fox 2433 (BRI, DNA); 'Common Rock' Creek, Jabiluka Outlier, Waterhouse 9620 (BRI).

Distribution and habitat: The species is restricted to a small area in the northern part of the Northern Territory where it is found in shallow soils often on tops of cliffs.

Affinities: The relationships of *A. scopularum* are not at all clear. In general appearance it resembles *A. spirorbi* and *A. leptostachya*, and has been distributed from DNA as the latter, but differs from both in its small 4-merous flowers. On the other hand, it does not appear to be particularly close to the 4-merous juliflorous species of south-eastern Queensland (Pedley 1964).

Etymology: The specific epithet is genitive plural of Latin *scopulus*, a rock or cliff, a reference to the habitat of the species.

****Acacia solenota* Pedley, sp. nov.** quoad ramulos complanatos, florum structuram amplitudinemque, inflorescentias paene albas, semina parva funiculo recto *A. calyculatae* A.Cunn. ex Benth. similis autem ab ea plantae statura majore (frutex densus usque 5 m altus), cortice fibrosa, phyllodiis saepe brevioribus, latioribus et minus elongatis, praecipue leguminibus angularibus valvis profunde canaliculatis constructis distinguitur. **Typus:** Queensland. COOK DISTRICT: 11.9 km E of Hopevale-Starcke road, on track to the McIvor River mouth, 15°06'S 145°12'E, 14 August 1984, J.R. Clarkson 5475 (holo: BRI; iso: MBA, CANB, DNA, K, MEL, MO, NSW, PERTH, QRS).

Dense spreading shrub to c. 5 m tall, branching from near the base; bark grey-brown, longitudinally fibrous; branchlets glabrous, complanate; young growth reddish brown and scurfy. Phyllodes coriaceous, elliptic, asymmetric, lower margin more or less straight, upper curved, 8–10.5(–12.5) cm long, 15–25(–32) mm wide, 3.2–5.5 times longer than wide; glabrous; with many fine longitudinal non-anastomosing nerves, 2 or 3 more prominent than the rest; obtuse with a small callus mucro; gland at the base of the phyllode inconspicuous; pulvinus 3–7 mm long. Flowers in dense spikes, 25–35 mm long, almost white, on peduncles 6–8 mm long, 1, 2 or 3 in the upper axils, each peduncle subtended by a small ovate bract, rachis glabrous; bracteoles curved, concave, hirsute on the back, about as long as the calyx. Flowers 5-merous; calyx broadly cupular, sinuolately lobed, hirsute at base, c. 0.4 mm long; corolla deeply lobed, glabrous, c. 1.8 mm long, midribs of lobes prominent; stamens c. 3 mm long, ovary glabrous. Pods straight, to 12 cm long, 8–10 mm wide, c. 8 mm thick, woody; valves widest near apex, narrowed to the base, opening elastically from the apex; each valve with a longitudinal dorsal groove c. 3 mm deep. Seeds up to 12 in each pod, longitudinally arranged; none seen but impressions in valves quite plain.

Specimens: **Queensland.** COOK DISTRICT: 12.5 km NW of the beach on the track from Starcke Station to McIvor River mouth, 15°04'S 145°09'E, Feb 1984, *Clarkson* 5145 (BRI, K, MBA, MEL, NSW, PERTH, QRS); Leprosy Creek, Cooktown, Oct 1986, *McLean* (AQ441388) (BRI).

Distribution and habitat: The species is confined to Quaternary sand-dunes between Cooktown and Cape Flattery where it occurs, sometimes in dense pure stands, in scrubs.

Affinities: *Acacia solenota* is closely related to *A. calyculata* but is a much larger plant with usually shorter and wider phyllodes and, above all, by the deeply grooved valves of the pod.

Etymology: The epithet is derived from Greek *solen*, *solenos*, channel or pipe or deeply grooved tile, a reference to the characteristically grooved valves of the pod.

****Acacia tingoorensis* Pedley, comb. et stat. nov.**

Acacia longispicata subsp. *velutina* Pedley, *Austrobaileya* 1:176(1978).

Type: Queensland. BURNETT DISTRICT: 12 km [sic] NW of Kingaroy, 26°23'S 151°41'E, 19 August 1973, *L. Pedley* 4134 (holo: BRI; iso: A, B, BRI, CANB, E, L, MO, NSW, PR).

Distribution and habitat: The species is restricted to a low hill some 25 km NW of Kingaroy. It occurs on shallow loamy and sandy soils as understory in eucalypt woodland and forms dense stands in disturbed situations on roadsides.

Affinities: *Acacia tingoorensis* is one of a taxonomically 'difficult' group of species that includes *A. concurrens* Pedley, *A. crassa* Pedley, *A. leiocalyx* and *A. longispicata* Benth. It differs from the last, to which it was referred as a subspecies, in having dense erect velvety (not appressed) hairs on the branchlets extending to the rachis of the spikes. Pods and seeds may provide additional differences but pods of *A. tingoorensis* are unknown to me. Though plants flower every year, all attempts at collecting fruits in the last five or six years have failed.

Etymology: The epithet is derived from Tingoora, the name of the nearest centre of population, some 10 km east of the type locality.

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Two new species of *Stylidium* Willd. (Stylidiaceae) from north Queensland

A.R. Bean

Summary

Bean, A.R. (1999). Two new species of *Stylidium* Willd. (Stylidiaceae) from north Queensland. *Austrobaileya* 5(2): 323-330. Two new *Stylidium* species, *S. leiophyllum* and *S. ramosissimum*, and their closest relative, *S. eriorhizum* R.Br. are described, illustrated and distinguished in a key. Distribution maps, and notes on conservation status are provided.

Key words: *Stylidium*, Stylidiaceae, Australian flora, key, *Stylidium eriorhizum*, *Stylidium leiophyllum*, *Stylidium ramosissimum*.

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Introduction

The genus *Stylidium* occurs throughout Australia, especially in the south-west and across the tropics. A few species also extend to Malesia (Slooten 1954) and into south-east Asia (Anon. 1972). A monograph of the genus was provided by Mildbraed (1908), who provided a subgeneric and sectional classification of the genus. Mildbraed placed *S. eriorhizum* R.Br. in *S. sect. Debiles* Milbraed.

S. eriorhizum and the two new species described here all have a thick woolly base at ground level, above which the leaves emerge.

The thick woolly plant base is rare in the genus, being otherwise known in *S. eglandulosum* F.Muell. (Qld, N.S.W.) and *S. humphreysii* Carlquist (W.A.).

S. eriorhizum and the two newly described species form a rather distinctive group within the genus, most noticeably by virtue of the woolly plant base and broad rosetted leaves with a hair-like mucro, but also by the indeterminate central rachis of the inflorescence, the mucronate bracts and the more or less spherical seeds with a colliculose surface.

Key to the species of the *Stylidium eriorhizum* group

1. Inflorescence branches and bracts glabrous, leaves (including petioles)
9–14 mm long ***S. ramosissimum***
Inflorescence branches and bracts glandular-hairy, leaves (including
petioles) 20–60(–100) mm long 2
2. Leaf margins hairy; bracts 1.5–2.5 mm long; calyx lobes 1.0–1.7 mm long. . . ***S. eriorhizum***
Leaf margins glabrous; bracts 3.5–6.5 mm long; calyx lobes 2.4–2.8 mm long. . . ***S. leiophyllum***

Stylidium eriorhizum R.Br., Prodr. 569 (1810); *Candollea eriorhiza* (R.Br.) F.Muell., Syst. Census Austral. pl. 86 (1883). **Type:** Queensland. PORT CURTIS DISTRICT: Thirsty Sound, Shoalwater Bay, 3 September 1802, *R. Brown* (holo: BM).

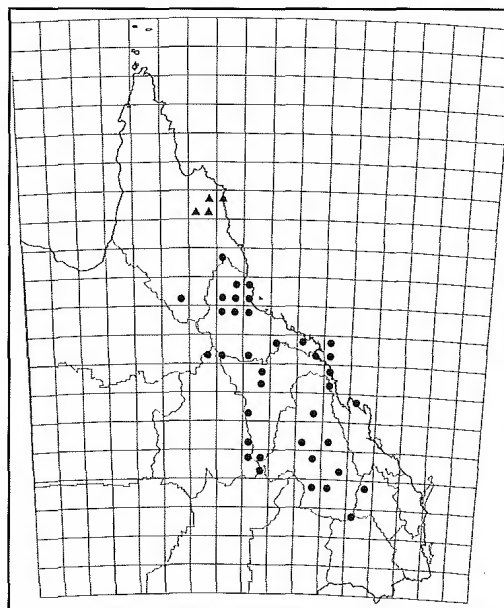
Perennial herb, 12–25 cm high. Glandular hairs present, 0.3–0.6 mm long, glands ellipsoidal. Base of plant woolly, consisting of densely packed eglandular multicellular trichomes up to 9 mm long. Stems greatly reduced, appearing absent, with leaves in basal rosette. Leaves 20–100, spatulate to oblanceolate, grading into indistinct petiole, 20–60(–100) mm long

(including petiole), 4–10 mm wide, glabrous except for short eglandular hairs along margin; apex obtuse, but with slender acumen 2–7 mm long. Scapes 1–3 per plant, 1–1.2 mm in diameter, glandular-hairy. Inflorescences (including scape) 10–23 cm long, central rachis indeterminate, branches monochasially (or rarely dichasially) cymose, glandular-hairy; peduncles 5–10 mm long; bracts ovate to deltate, 1.5–2.5 mm long, glandular-hairy, mucronate. Flowers solitary in axils of bracts. Pedicels 3–6 mm long, glandular-hairy. Hypanthium ellipsoidal, c. 2.5 mm long at anthesis, glandular-hairy throughout. Sepals lanceolate, all free, $1.0\text{--}1.7 \times 0.5\text{--}0.7$ mm, glandular-hairy, apex obtuse or acute. Corolla pink to white, glandular-hairy on tube and petals; tube 1.5–2.0 mm long, with sinus on anterior side only; petals laterally paired, anterior petals $2.5\text{--}3.3 \times 1.0\text{--}1.4$ mm, entire, obtuse; posterior petals $2.5\text{--}3.5 \times 1.0\text{--}1.5$ mm, entire, obtuse. Throat appendages absent. Labellum broadly ovate, 0.6–0.9 mm long, attached at base of anterior sinus, glabrous, apex obtuse, basal appendages 2, minutely papillose. Column of uniform width throughout, 7.5–8.5 mm long, glabrous; stigma cushion-shaped; anthers fringed by short eglandular corona, extending just beyond column. Capsule obovoid to ellipsoidal, 5–6.5 mm long (excluding sepals), 2.5–3 mm wide, faintly 5-ribbed. Seeds spherical with small nipple, 0.4–0.5 mm diameter, dark brown to black, surface colliculose (Fig. 1 G–I).

Selected specimens: **Queensland.** COOK DISTRICT: Portion 200, 6 km NW of Atherton, Jan 1966, *Hyland* 4077 (BRI). NORTH KENNEDY DISTRICT: Mt Abbot, 50 km W of Bowen, Mar 1992, *Bean* 4207 (BRI); 1.5 km (by road) west of Herberton, on Herberton-Petford road, May 1983, *Conn & Clarkson* 1124 (BRI, CANB, HO, MBA, MEL, NSW); Harold Island, Nov 1985, *Batianoff* 3396 & *Dalliston* (BRI); west of Kaban, Nov 1989, *Elick* 85 (QRS); 17 km past Paluma on road to Hidden Valley, Jan 1992, *Forster* PIF9485 (BRI); Blencoe Creek, adjacent to the Cashmere-Kirrama road, Dec 1995, *Wannan* 235 (BRI); Hinchinbrook Island, Jun 1987, *Warrian* CW8217 (BRI). SOUTH KENNEDY DISTRICT: Cape Palmerston N.P., beach hut headland, Sep 1995, *Champion* 1247 & *Pollock* (BRI); 9 miles [14 km] NE of “Glen Avon” H.S., Jul 1964, *Pedley* 1727 (BRI); 12 km SW of “Mt Douglas” H.S., Jun 1992, *Thompson* BUC477 & *Sharpe* (AD, BRI). MITCHELL DISTRICT: c. 15 km SSE of “Warang”, NNW of Torrens Creek, Oct 1988, *Cumming* 8492 (BRI); 20 km from Jericho on Blackall road, Feb 1994, *Forster* PIF15014 & *Bean* (BRI). LEICHHARDT DISTRICT:

“Wandobah”, c. 11 km NE of Dingo, Jul 1987, *Anderson* 4351 (BRI, CANB); Mount Flora-Dingo road, 6 km S of May Downs turnoff, Jul 1992, *Bean* 4674 (BRI); “Humboldt”, 45 km NE of Rolleston, Jan 1996, *Bean* 9584 (BRI); Carnarvon Range, between Roma and Springsure, Oct 1933, *White* 9470 (BRI). PORT CURTIS DISTRICT: west coast of Shoalwater Bay, near Mooly Ck, Apr 1945, *Blake* 15587 & *Webb* (BRI). BURNETT DISTRICT: on Eidsvold-Cracow road, 1 km N of Little Morrow Creek crossing, Jul 1990, *Forster* PIF7006 (BRI, MEL). DARLING DOWNS DISTRICT: north of Waaje tower, Barakula S.F., north of Chinchilla, Mar 1994, *Bean* 7566 (BRI).

Distribution and habitat: *S. eriorhizum* is widespread in Queensland as far north as Atherton, and as far south as the Barakula State Forest near Chinchilla. It extends to the central Queensland coast, and to some continental islands, and inland as far as Jericho and Torrens Creek (Map 1). It inhabits woodlands and heathlands on sandy soils.



Map 1. Distribution of *Stylidium eriorhizum* ● and *S. ramosissimum* ▲.

Phenology: Flowers and fruits can be found throughout the year.

Note: The spelling of the species epithet *eriorhizum* is a matter of some contention. According to Stearn (1992: 261), the second part of a compound Greek word beginning with *rh* should have an additional *r* added to it when preceded by a vowel, but he also points out

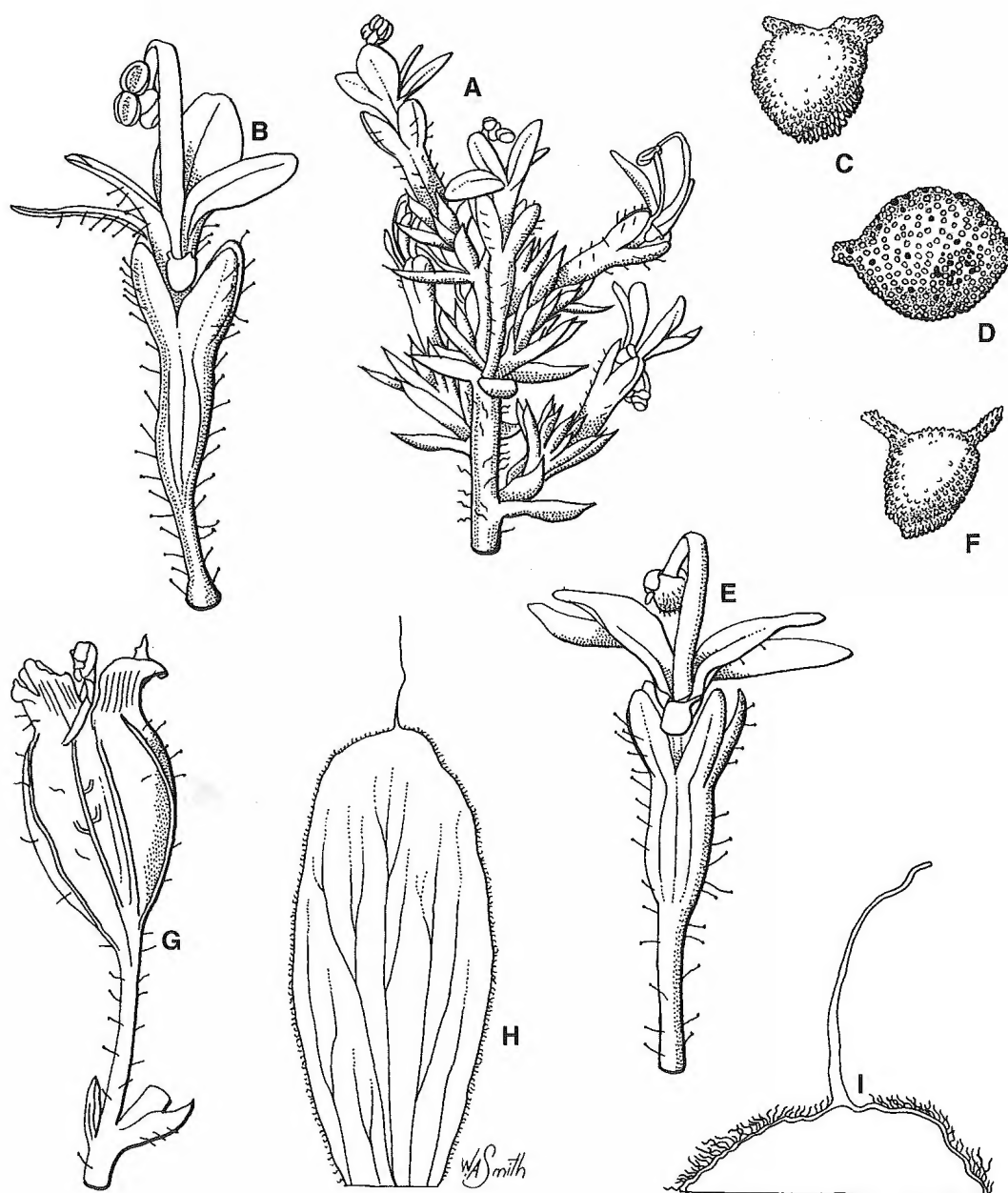


Fig. 1. A–D: *Stylidium ramosissimum*. A. portion of inflorescence $\times 3$. B. flower $\times 6$. C. labellum $\times 20$. D. seed $\times 24$. E–F: *Stylidium leiophyllum*. E. flower $\times 6$. F. labellum $\times 20$. G–I: *Stylidium eriorhizum*. G. fruit $\times 6$. H. leaf $\times 3$. I. close-up of leaf margin $\times 9$. A–C, Forster 12850 & Bean; D, Bean 1740; E–F, Clarkson 7722 & Neldner; G, Johnson 2140; H–I, Forster 3740.

that many reputable authors have omitted this additional *r*, and so it is best regarded as optional and an author's original spelling should be accepted. Brown spelt his epithet *eriorhizum*, and hence this spelling is maintained here. By contrast, Mueller named *Stylidium leptorrhizum* with the additional *r*, and this spelling should also be maintained.

Conservation status: *S. eriorhizum* is a common and widespread species.

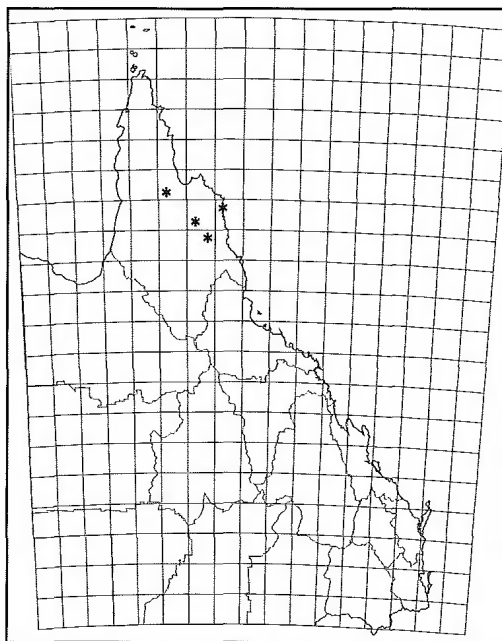
Stylidium leiophyllum A.R.Bean **sp. nov.**
affinis *Stylidio eriorhizo* sed foliis apicibus acutis et marginibus glabris, bracteis 3.5–6.5 mm longis, calycis lobis 2.4–2.8 mm longis et petalis aliquanto longioribus differens. **Typus:** Queensland. COOK DISTRICT: 0.9 km north of the Big Coleman River on the Peninsula Development road, 14°34'S 143°25'E, 21 December 1988, J.R. Clarkson 7722 & V.J. Neldner (holo: BRI; iso: DNA, K, MBA, PERTH, QRS).

Stylidium sp. (Big Coleman River J.R.Clarkson+ 7722) in Henderson (1997).

Perennial herb 8–17 cm high. Glandular hairs 0.25–0.6 mm long, glands ellipsoidal. Base of plant woolly, consisting of densely packed eglandular multicellular trichomes up to 9 mm long. Stems greatly reduced appearing absent, with leaves in basal rosette. Leaves 20–100 per plant, narrowly oblanceolate to narrowly spatulate, grading into indistinct petiole, 28–50 mm long (including petiole), 3–6 mm wide, glabrous, including margins; apex acute, but with slender acumen to 2.5 mm long. Scapes 1–6 per plant, 0.6–1.1 mm in diameter, hairs erect and glandular or crisped and eglandular. Inflorescences (including scape) 8–17 cm long, central rachis indeterminate, branches dichasially or monochasially cymose, glandular-hairy; peduncles 5–7 mm long; bracts deltate, glandular-hairy, 3.5–6.5 mm long, apex acute to mucronate. Flowers solitary in axils of bracts. Pedicels 3–4 mm long, glandular-hairy. Hypanthium ellipsoidal, 2.5–2.8 mm long at anthesis, glandular-hairy throughout. Sepals deltate, all free, 2.4–2.8 × 0.8–1.0 mm, glandular-hairy, apex obtuse to acute. Corolla

pink, glandular-hairy on petals only; tube 1.5–1.8 mm long, with sinus on anterior side only; petals laterally paired, anterior petals 3.0–3.5 × 1.4–1.6 mm, entire, obtuse; posterior petals 3.5–4.0 × 1.8–2.0 mm, entire, obtuse. Throat appendages absent. Labellum ovate, c. 1 mm long, attached at base of anterior sinus, apex obtuse; basal appendages 2, minutely papillose. Column of uniform width throughout, glabrous, 7–7.5 mm long; stigma cushion-shaped; anthers fringed by short eglandular corona, not extending beyond column. Capsule ellipsoidal to obovoid, 3.5–5.2 mm long (excluding sepals), 1.7–3.1 mm wide, faintly 5-ribbed. Seeds globose with small nipple, 0.5–0.6 mm diameter, dark brown, surface colliculose (Fig. 1 E–F, Fig. 2).

Specimens examined: Queensland. COOK DISTRICT: upper reaches of Garden Creek, E of Jowalbinna-Maytown road, Jul 1990, *Bean* 1760 (BRI); south-east of Isabella Falls, towards Cooktown, Jul 1998, *Bean* 13636 (BRI, NSW); north-west of Cooktown near Isabella Falls, May 1970, *Blake* 23418 (BRI); 19 km S of the Palmer River crossing on the Peninsula Development road, Mar 1987, *Clarkson* 6646 & *McDonald* (BRI, K, MBA, PERTH, QRS); 13.3 km from the McIvor River crossing on the Hopevale to Starcke road towards Battlecamp, May 1993, *Clarkson* 10070 & *Neldner* (BRI, K, MBA, PERTH).



Map 2. Distribution of *Stylidium leiophyllum* *.



Fig. 2. Whole plant of *Stylidium leiophyllum* $\times 1$.

Distribution and habitat: *S. leiophyllum* is known from a few locations in south-eastern Cape York Peninsula, between Coen and Mt Carbine (Map 2). It grows in shallow to deep sandy soils, on flat to very hilly sites, which may be rocky. It is associated with species such as *Melaleuca citrolens* Barlow, *M. viridiflora* Sol. ex Gaertn., *Eucalyptus nesophila* Blakely and *Petalostigma banksii* Britten & S.Moore.

Phenology: Flowers are recorded for December and March; fruits are recorded for May and July.

Affinities: *S. leiophyllum* is close to *S. eriorhizum*, but differs by its leaves with acute apices (obtuse for *S. eriorhizum*) and glabrous margins (hairy for *S. eriorhizum*), bracts 3.5–6.5 mm long (1.5–2.5 mm for *S. eriorhizum*), sepals 2.4–2.8 mm long (1.0–1.7 mm for *S. eriorhizum*), and its somewhat larger petals.

Conservation status: *S. leiophyllum* has a scattered and somewhat restricted distribution, but it is not considered rare or threatened at this time.

Etymology: The epithet is from the Greek, *leio*-smooth, and *-phyllus*-leaf. This is in reference to the glabrous leaf margins, which distinguishes it from *S. eriorhizum*.

Stylidium ramosissimum A.R.Bean sp. nov.
affinis *Stylidio eriorhizo*, sed foliis multo minoribus, scapo pilis glandularibus carente, inflorescentia semper dichasialiter ramosa, bracteis longioribus et seminibus majoribus differens. **Typus:** Queensland. COOK DISTRICT: Turtle Rock area, Laura sandstone escarpment, 15°39'S 144°30'E, 22 January 1993, *P.I. Forster* PIF12850 & *A.R. Bean* (holo: BRI; iso: DNA, MEL).

Stylidium sp. (Laura L.S.Smith 12050) in Henderson (1997).

Perennial herb 11–17 cm high. Glandular hairs 0.2–0.4 mm long, glands ellipsoidal. Base of plant woolly, consisting of densely packed eglandular multicellular trichomes up to c. 3 mm long. Stems greatly reduced appearing absent, with leaves in basal rosette. Leaves 7–

20 per plant, oblanceolate to broadly spatulate, grading into indistinct petiole, 9–14 mm long (including petiole), 1.8–4.5 mm wide, glabrous except for short eglandular hairs along margin; apex obtuse, but with slender acumen to 1.2 mm long. Scapes 1–5 per plant, with eglandular hairs. Inflorescences (including scape) 11–17 × 1.5–3 cm long, central rachis indeterminate, branches dichasially cymose, glabrous; peduncles 2.5–3 mm long; bracts deltate, glabrous, 2.8–5.0 mm long, mucronate. Flowers solitary in the axils of the bracts. Pedicels 3.0–3.5 mm long, glandular-hairy. Hypanthium ellipsoidal, 3–4 mm long at anthesis, glandular-hairy throughout. Sepals deltate, all free, 2.3–2.8 × 0.9–1.0 mm, glandular-hairy, apex obtuse. Corolla pink, glandular-hairy on petals only; tube 1.6–2.2 mm long, with sinus on anterior side only; petals laterally paired, anterior petals 3.0–3.5 × 1.4–1.7 mm, entire, obtuse; posterior petals 4.0–4.5 × 1.5–1.8 mm, entire, obtuse. Throat appendages absent. Labellum broadly-ovate, c. 0.6 mm long, attached at base of anterior sinus, apex obtuse or retuse, basal appendages 2, minutely papillose. Column of uniform width throughout, glabrous, 7.5–8 mm long; stigma cushion-shaped; anthers fringed by short eglandular corona, not extending beyond column. Fruit ellipsoidal, 4.6–5.0 mm long (excluding sepals), 1.8–2.5 mm wide, faintly 5-ribbed. Seeds spherical except for prominent nipple, 0.7–0.8 mm across, brown, surface colliculose (Fig. 1. A–D, Fig. 3).

Specimens examined: Queensland. COOK DISTRICT: 7 km E of Jowalbinna, Jul 1990, *Bean* 1740 (BRI); W of Branningham Bluff, c. 25 km NW of Cooktown, Jul 1990, *Bean* 1974 (BRI); Split Rock gallery, 12.7 km south of Laura, May 1982, *Clarkson* 4274 (BRI, QRS); c. 5–6 miles [8–10 km] SE of Laura, Oct 1962, *Smith* 12050 (BRI).

Distribution and habitat: *S. ramosissimum* is confined to a relatively small area at the southern end of Cape York Peninsula, from Jowalbinna to near Cooktown (Map 1). It is confined to sandstone hillsides and escarpments in woodland dominated by *Eucalyptus stockeri* D.J.Carr & S.G.M.Carr, *E. tetradonta* F.Muell., *E. phoenicea* F.Muell. or *E. nesophila* Blakely.

Phenology: Unknown; it possibly flowers and fruits sporadically throughout the year.



Fig. 3. Whole plant of *Stylidium ramosissimum* $\times 1$.

Affinities: *S. ramosissimum* differs from *S. eriorhizum* by its leaves 9–14 mm long (20–60(100) mm long for *S. eriorhizum*), scape lacking glandular hairs, strictly dichasially branched inflorescence (usually monochasial for *S. eriorhizum*), bracts 2.8–5.0 mm long (1.5–2.5 mm long for *S. eriorhizum*) and seeds c. $0.9 \times 0.75 \times 0.75$ mm (0.4–0.5 mm diameter for *S. eriorhizum*).

S. ramosissimum differs from *S. leiophyllum* by its labellum only 0.6 mm long (obtuse and 1.0 mm long for *S. leiophyllum*), the glabrous peduncles and bracts, and the leaves (including petioles) 9–14 mm long with hairy margins (20–60(–100) mm long with glabrous margins for *S. leiophyllum*).

Conservation status: *S. ramosissimum* has a scattered and somewhat restricted distribution, but it is not considered rare or threatened at this time.

Etymology: The specific epithet is derived from the Latin word *ramosissimus*, meaning very much branched. This is in reference to the inflorescence.

Acknowledgements

I would like to thank Don Foreman (Australian Botanical Liaison Officer 1996–97) for photographing the type of *S. eriorhizum*, Peter Bostock for the Latin diagnoses, the Director of QRS for access to that Herbarium and Will Smith for the illustrations.

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A new species of *Habenaria* Willd. (Orchidaceae) from North Queensland

Peter S. Lavarack and Alick W. Dockrill

Summary

Lavarack, Peter S. and Dockrill, Alick W. A new species of *Habenaria* Willd. (Orchidaceae) from North Queensland. *Austrobaileya* 5(2): 331–335. *Habenaria praecox* Lavarack & Dockrill is described and illustrated. Relationships of this species to other Australian species are discussed and a key to Queensland species of *Habenaria* and *Peristylus* is provided.

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Introduction

For a number of years the species *Habenaria ochroleuca* R.Br. was considered to occur in north Queensland. A.W. Dockrill (1969) illustrated material of a taxon in the genus *Habenaria* as *H. ochroleuca*. Research by D.L. Jones (pers. com.) in the Northern Territory, from where Brown collected material he originally described as *H. ochroleuca*, established that the material previously thought to belong to this taxon in north Queensland, is significantly different from that from the Northern Territory and probably represents an undescribed species. Comparisons with the type description of *H. ochroleuca* (Brown 1810), also suggested that the taxa are separate. A specimen was sent to M.A. Clements, while he was at Kew, and he agreed that the North Queensland taxon was distinct from *H. ochroleuca* (M.A. Clements pers. com.). In early 1997 one of the authors (P.S.L.) found flowering plants of this taxon near Cardwell in north Queensland. This fresh material allowed further comparisons to be made with illustrations of *H. ochroleuca* (Jones 1988), and these confirmed that the north Queensland material was distinct. Comparisons were made with descriptions and illustrations of *Habenaria* species from adjacent regions including New Guinea, Java, Sulawesi, The Solomon Islands, Vanuatu and New Caledonia and no identical taxon was discovered.

Habenaria praecox Lavarack et Dockrill, **sp. nov.** affinis *H. propinquiori* Rchb.f. sed tuberibus multum majoribus (35–50 non 7–15 mm longis) et floribus labelli lobis lateralibus latis et decurvis non tenuibus et sursum in semicirculo curvatis differt. **Typus:** Queensland. NORTH KENNEDY DISTRICT: about 12 km south of Cardwell. 18° 23'S, 146° 05'E, 6 February 1997, P.S. Lavarack PSL 4001 (holo: BRI; iso: BRI).

Tubers 2, obloid or ellipsoid, up to 50 × 25 mm. Leaves 2–4 basal, or sometimes one low on the inflorescence stem, more or less erect and sometimes sheathing at the proximal end, narrowly oblong to narrowly obovate, 50–100 × 4–6 mm, canaliculate, acuminate or acute. Inflorescence 20 to 50 cm tall, with axis 1–2 mm diameter; cauline bracts 2 to 6, subulate, 6–20 mm long. Rachis 3- to 35-flowered; flowers moderately dense or rather sparse and often irregularly arranged; bracts usually about half the length of the ovary; pedicels about 1 mm long. Flowers 9–10 mm across, white with the dorsal sepal often green; dorsal sepal and petals galeate; lateral sepals widely spreading; spur on the labellum curved downwards or directed straight backwards. Dorsal sepal cucullate-ovate, 3.5–4 × c. 2.5 mm, slightly constricted near the blunt apex. Lateral sepals subfalcate, c. 2 mm longer and 1 mm narrower than the dorsal sepal, constricted at the distal end. Petals broadly subfalcate, about as long as or slightly longer

than, and about the same width as the dorsal sepal, often with a small lobe on the posterior side near the base. Labellum cuneate or semi-circular at the proximal end and then deeply trilobate, about twice as long as the dorsal sepal; lateral lobes spreading and directed downwards and forwards, about as long as the mid-lobe, narrowly triangular to almost narrowly oblong, the ends slightly curved upwards, about the same length as the lateral sepals and usually about 1 mm broad; mid-lobe narrowly oblong, slightly tapered, obtuse or rounded at the apex, $3.5\text{--}4 \times c.1$ mm; spur broad at the orifice, constricted at the middle, dilating near the distal end, with the extreme distal end constricted, 9–3 mm long. Column auriculate, suberect, conical or subcylindrical c. $3 \times 3 \times 2$ mm. Anther emarginate distally; thecal tubes widely separated at the proximal end, somewhat converging distally, about half as long as the stigmatophores and adnate to them; bursicles not in evidence on any specimens seen. Pollinia soft, granular and difficult to remove from anther cells; caudicles slender, tapered, reticulate, at about a 90° angle to the pollinia and about two thirds their length. Stigmatophores adnate only near the base to the labellum, grooved below. Ovaries twisted and curved to a varying extent and direction, 9–13 mm long (Fig. 1).

Additional specimen examined: Queensland. COOK DISTRICT: 5 km south of Bamaga, Dec 1976, P.S. Lavarack 1070 [AQ193390] (BRI).

Distribution and habitat: Specimens of this species from near Cardwell and from near Bamaga on Cape York Peninsula have been seen for this study. *H. praecox* (reported as *H. ochroleuca*) has also been reported from near Proserpine, Gordonvale, Julatten, Coen and the Gulf of Carpentaria (Dockrill 1969).

This species occurs in lowland woodlands dominated by tea trees (*Melaleuca viridiflora*) and also in lowland woodlands comprising bloodwoods (*Corymbia* spp) and *Eucalyptus* spp. It is confined to areas where the drainage is poor and the soil stays damp for long periods during the wet season. The species is most abundant in areas where the ground cover is sparse and less than 0.5 m tall. All areas where this species occurs are subject to a distinct dry season from June to December. Dry season fires, which occur about every five years, are a feature of this habitat.

Affinities: This species has been confused with *H. ochroleuca* R.Br. (eg Dockrill 1969 p 38,39), but is readily distinguished from that species as shown in the following table:

Table 1. Morphological comparison of *H. praecox* and *H. ochroleuca*

Distinguishing Characters	<i>H. praecox</i>	<i>H. ochroleuca</i>
Lateral lobes of labellum	directed downwards, about 1 mm broad	prominently upturned, about 3 mm wide
Labellum spur	about the same length as the mid-lobe of the labellum	about twice the length of the mid-lobe of the labellum
Leaves	2 to 4, basal	reduced to sheathing bracts along the stem

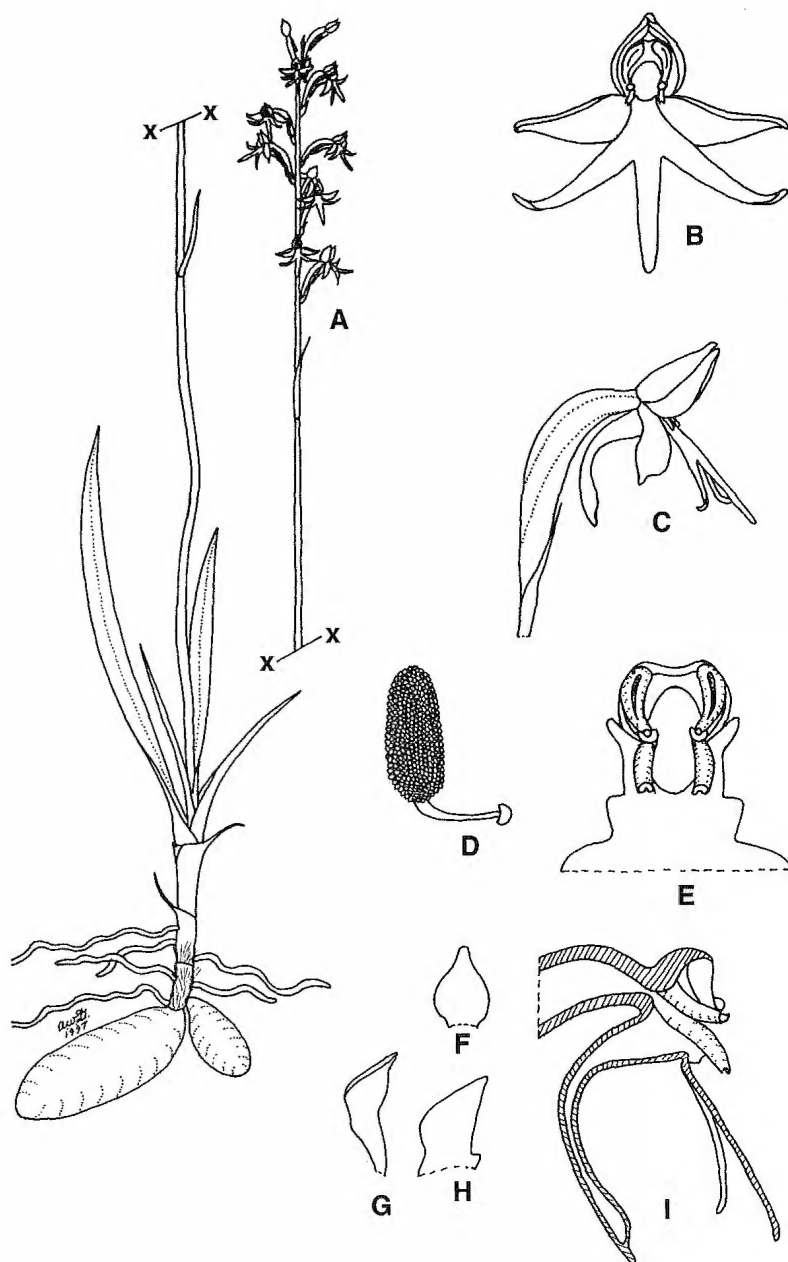


Fig. 1. *Habenaria praecox*. A. plant $\times 0.6$. B. flower from the front $\times 3.6$. C. flower from the side $\times 3.6$. D. pollinarium $\times 12$. E. column from the front $\times 6$. F. dorsal sepal $\times 3$. G. lateral sepal $\times 3$. H. petal (flattened out) $\times 3$. I. longitudinal section of flower $\times 6$. Del. A.W. Dockrill.

While *H. praecox* is similar to *H. ochroleuca* from the Northern Territory and Western Australia, it is more likely to be confused with *H. propinquior* Rchb.f. and *H. xanthantha* F.Muell., both of which occur in the same habitat in north Queensland. These three species have a similar appearance and can be confused when seen from a distance or when not in flower. However, the details of the labellum can be used to distinguish them. In *H. propinquior*, the lateral lobes of the labellum are filiform and curved upwards, while they are broader and trend downwards in *H. praecox*. Both *H. praecox* and *H. propinquior* have a well developed spur on the labellum, at least as long as the mid lobe of the labellum. In *H. xanthantha* the spur is either absent or, if present, is shorter than the mid-lobe of the labellum and the lateral lobes of the labellum are not distinct as they are in *H. praecox* and *H. propinquior*, often being reduced to very small bumps on the side of the mid-lobe.

The species illustrated in colour plate 28 on page 215 of Dockrill (1992) as *H. ochroleuca*, is *H. praecox*.

Phenology: *H. praecox* flowers in December and January, just as the wet season is commencing. It flowers before both *H. xanthantha* and *H. propinquior*, with little overlap of flowering time. There is some evidence that flowering is related to fire history and to early season rains in November and December. In some years, when conditions are unfavourable few, if any, plants flower.

Conservation status: *H. praecox* is not known to be conserved on any national parks, but probably occurs on Lumholtz National Park and Jardine River National Park. Coastal habitats near Cardwell, north Queensland, have been greatly reduced by clearing in recent times and this must have resulted in a reduction in

population numbers. The exact conservation status of this species is unclear and it may be more common than it appears, but at present it should be regarded as 3R (rare species with a range greater than 100 km in Australia, but occurring in small populations which are mainly restricted to highly specific habitats) according to the criteria of Thomas and McDonald (1989).

Etymology: The specific epithet *praecox* means “early” and refers to the comparatively early flowering of this species. This is the first of the four commonly-occurring species of *Habenaria* in the coastal lowlands of the Queensland’s wet tropics to flower each wet season.

Acknowledgments

Thanks are due to Len and Kate Lawler of Atherton for assistance on field trips and in many other ways. Rod Henderson prepared the Latin diagnosis. Both Dave Jones and Mark Clements provided the authors with advice and compared specimens on their behalf.

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Key to the species of *Habenaria* Willd. and *Peristylus* Blume occurring in Queensland

1. Leaves arising at, or close to, ground level 7
 Leaves not arising at ground level 2
2. Lowest leaves several cm above ground level, in the middle of the stem
 **P. tradescantifolius** (Rchb.f.) Kores
 Leaves scattered along the stem 3
3. Labellum spur shorter than the sepals **P. banfieldii** (F.M. Bailey) Lavarack
 Labellum spur longer than the sepals 4
4. Petals entire 5
 Petals bilobate 6
5. Petals unguiculate **H. divaricata** R.S.Rogers & C.T.White*
 Petals not unguiculate (leaves sometimes basal in small plants)
 **H. rumphii** (Brongn.) Lindl.*
6. Anterior lobe of petal slightly longer than or equal to posterior lobe
 **H. macraithii** Lavarack
 Anterior lobe of petal much shorter than posterior lobe **H. hymenophylla** Schltr.
7. Flowers horizontal, tubular in proximal half **P. candidus** J.J.Sm.
 Flowers erect and opening widely 8
8. Labellum spur less than 20 mm long, shorter than, equal to, or up to twice
 as long as the labellum lobes 9
 Labellum spur more than 20 mm long, at least three times as long as the
 labellum lobes 12
9. Lateral lobes of labellum filiform, curving strongly upwards; labellum spur
 almost twice as long as the mid lobe of the labellum **H. propinquior** Rchb.f
 Lateral lobes of labellum broadly or narrowly triangular, horizontal or
 directed downwards oral most absent; labellum spur either almost absent,
 or shorter than, or equal to, the mid lobe of the labellum 10
10. Labellum spur always present and about as long as the mid lobe of the
 labellum; lateral labellum lobes well developed and about the same length
 as mid lobe **H. praecox** Lavarack & Dockrill
 Labellum spur variable in size, even within flowers on a single
 inflorescence, from absent to very short, or occasionally equal to the
 mid lobe of the labellum; lateral lobes of labellum absent, or uneven
 in size and shorter than the mid lobe 11
11. Labellum longer than 7 mm **H. harroldii** D.L.Jones
 Labellum shorter than 7 mm **H. xanthantha** F.Muell
12. Lateral lobes of labellum filiform; stigmatophores less than twice the
 length of the thecal tubes **H. triplonema** Schltr.
 Lateral lobes of labellum narrow linear, often asymmetrical; stigmatophores
 more than twice the length of the thecal tubes **H. elongata** R.Br.

* *H. divaricata* and *H. rumphii* are very similar in both plant habit and flower form. No specimen referable to *H. divaricata* has been collected since the type and it is extremely likely that the two species will be shown to be conspecific.

***Oldenlandia gibsonii* (Rubiaceae: Hedyotideae), a new species from south east Queensland**

D.A. Halford

Summary

Halford, D.A. (1999). *Oldenlandia gibsonii* (Rubiaceae: Hedyotideae), a new species from south east Queensland. *Austrobaileya* 5(2): 337-339. *Oldenlandia gibsonii* is described and notes are provided on its habitat, distribution and conservation status.

Key words: Queensland, Rubiaceae, *Oldenlandia gibsonii*

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Introduction

This new species of *Oldenlandia* was first brought to my attention in 1992 when Norm Gibson, a keen naturalist from Gladstone, sent to the Queensland Herbarium for identification a specimen of this species that he had collected from Wietalaba State Forest south west of Gladstone. This first collection had only old fruit on it but was sufficient to show that the plant represented either a disjunct population of *O. polyclada* (F.Muell.) F.Muell. from north Queensland or an undescribed species closely related to *O. polyclada*. Since then more material of it has become available revealing that the plant warrants recognition as a distinct species.

***Oldenlandia gibsonii* Halford sp. nov.** arcte affinis *O. polycladae* (F.Muell.) F.Muell. autem ramificatione divaricata, foliis parvioribus (3–7 x 1–2 mm non 7–40 x 2–6 mm), pedicellis brevioribus (1–3 mm non 3–6 mm longis), calycis lobis parvioribus (0.1–1.0 mm non 2.0–8.0 mm longis), floribus semper solitariis in foliorum axillis (non solitariis vel in fasciculis 2–8 floris) differt. **Typus:** Queensland. PORT CURTIS DISTRICT: State Forest 583 Wietalaba, 24°17'S 151°13'E, 23 May 1996, *P.I. Forster* PIF19164 (holo: BRI: iso: BRI, CANB, K, MEL, MO, NSW, QRS distribuendi).

Oldenlandia sp. (Wietalaba N.Gibson 1344) in Henderson (1997).

Woody herbaceous perennial, densely intricately branched, to 1 m high, with thin, greyish, papery bark on mature stems; branchlets divaricate at c. 80 degrees, quadrangular when young becoming rounded with age, hispidulous; axillary branchlets short, persistent after senescence giving the plant a spinose appearance. Leaves opposite, appearing fasciculate on older branches due the short axillary branchlets, subsessile; lamina narrowly oblong to oblong-elliptic, 3–7 mm long, 1–2 mm wide, discolorous, glabrous or with minute scabrous hairs above, glabrous or sparsely hispidulous below, attenuate at base, obtuse, subacute or sometimes mucronulate at apex, with midrib prominent below and margins recurved when dry. Stipule sheath c. 1 mm long, hispidulous, produced into triangular lobe; margin fimbriate. Flowers solitary in penultimate leaf axils, appearing terminal by abortion or reduction of terminal shoot; pedicels slender, 1–3 mm long, glabrous or hispidulous. Hypanthium subglobose, c. 1 mm diameter, glabrous or sparsely hispidulous; calyx lobes broadly triangular, 0.6–1.0 mm long, obtuse to subacute at apex, joined at the base into free tube c. 1 mm long; margins entire. Corolla cream with lilac tinge and faint lilac blotches in throat, infundibular, glabrous; tube 4–5 mm long; lobes reflexed, triangular, 4–5 mm long. Stamens exserted; filaments 0.5–1.0 mm long; anthers linear-oblong, c. 2

mm long. Ovules c. 25–35 per locule. Style exerted, 6–7 mm long; stigma bifid; lobes linear, c. 2 mm long, reflexed. Capsule subglobose, c. 2 mm diameter, glabrous or subglabrous, not markedly furrowed along dissepiment; calyx lobes spreading; beak c. 1 mm long, rounded, not protruding above calyx lobes. Seeds numerous, depressed obconic or irregularly polygonal, c. 0.5 mm long; testa light brown, reticulate-areolate.

Selected specimens: **Queensland.** PORT CURTIS DISTRICT: State Forest 583 Wietalaba, 32 km S of Calliope, Jun 1992, Gibson TOI1315 (BRI); *ditto*, Nov 1993, Gibson 1343 (BRI, NSW); *ditto*, Apr 1994, Gibson 1344 (BRI); State Forest 583 Wietalaba, Dec 1995, Forster PIF18265, Orford & Tucker (BRI, MEL, QRS.); *ditto*, May 1996, Forster PIF19165 (BRI); Wietalaba State Forest, c. 31 km S of Calliope, Nov 1997, Halford Q3445 & Snow (BRI).

Distribution and habitat: *O. gibsonii* is known only from State Forest 583, 35 km west of Miriam Vale in central Queensland. It grows on reddish brown loams in Araucarian microphyll vineforest dominated by *Choricarpia subargentea* (C.T.White) L.A.S.Johnson, *Backhousia kingii* Guymer and *Barklya syringifolia* F. Muell.

Phenology: Flowers have been recorded in May and November; fruits have been recorded in April, November and December.

Affinities: *O. gibsonii* is closely related to *O. polyclada* but differs from that by its divaricate branching, smaller leaves (3–7 x 1–2 mm compared to 7–40 x 2–6 mm), shorter pedicels (1–3 mm long compared to 3–6 mm long), smaller calyx lobes (0.1–1.0 mm long compared to 2.0–8.0 mm long) and flowers always being solitary in leaf axils (compared to flowers solitary or being in 2–8-flowered fascicles in *O. polyclada*).

Conservation status: *Oldenlandia gibsonii* is known only from the type locality in State Forest 583 in central Queensland. The total known population of this species is estimated to consist of several thousand individuals. Actions are currently being undertaken to insure that the conservation of the site is secured. The recommended conservation status for this species as defined under the Queensland *Nature Conservation Act 1992* is Endangered (E).

Austrobaileya 5(2): 337–339 (1999)

Etymology: This species is named in honour of Norman Gibson, formerly of Gladstone, who brought this species to my attention.

Acknowledgements

I am grateful to N. Gibson for bringing this new species to my attention, P.I. Forster for making further collections of it, L. Pedley for the Latin diagnosis and W. Smith for the illustrations.

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Fig. 1. *Oldenlandia gibsonii*. A. branch $\times 1$. B. detail of part of a branch with short lateral branchlet and flower $\times 5$. C. lateral view of fruit $\times 10$. A & B, *Halford* et al. Q3445 (BRI); C, *Forster* et al. PIF18265 (BRI).

Jasminum jenniae (Oleaceae), a new species from south eastern Queensland

Wayne K. Harris & Glenn Holmes

Summary

Harris, Wayne K. & Holmes, Glenn (1999). *Jasminum jenniae* (Oleaceae), a new species from south eastern Queensland. *Austrobaileya* 5(2): 341–344. *Jasminum jenniae* sp. nov. is described, illustrated and compared to related species. Notes are provided on its distribution, habitat and conservation status. A key to the south eastern Queensland species of *Jasminum* is provided.

Key words: Oleaceae, *Jasminum jenniae*

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Introduction

The genus *Jasminum* L. in Australia consists of eight species and a number of subspecies and was most recently revised by Green (1984). The genus is widely distributed throughout eastern and northern Australia and two species extend further westwards. *J. calcareum* F.Muell. extends from central Australia through to Western Australia. *J. didymum* subsp. *lineare* (R.Br.) P.S.Green is the most widespread extending west from the Great Dividing Range in eastern Australia through central Australia and into the northern parts of Western Australia south of the Kimberley. The species described here has a limited distribution in south-eastern Queensland where four species have been previously enumerated including *J. jenniae* as an undescribed species (Stanley and Ross 1986).

Jasminum jenniae W.K. Harris & G. Holmes, **sp. nov.** affinis *J. aemulo* var. *brassii* P.S. Green autem floribus parvioribus tubo 9–12 mm longo lobis 7–10 mm longis; calyce pedicelloque glabro; foliis simplicibus oppositis venatione acrodroma, petiolo versus laminae basem articulato differt. **Typus:** Queensland. MORETON DISTRICT: Headwaters of south branch of Kobbie Ck, D'Aguilar Range, 27°17'S 152°46'E; 22 Nov. 1997, S. Phillips 143: (holo: BRI).

Evergreen shrub to about 4 m, multistemmed, straggling to prostrate; stem puberulent to glabrous. Leaves opposite, simple; petioles 3–5 mm long, sparsely puberulent to glabrous, articulated near base of lamina, sometimes a second articulation is present on the upper third of the petiole; lamina coriaceous, ovate to broadly ovate, glabrous, glossy, discolorous, (4.0–)4.5–6.5(–8.5) cm long and (1.3–)2.5–4.2(–5.8) cm wide; margin entire not thickened, slightly recurved; apex acute to acuminate; base attenuate into the petiole; venation raised above and below, acrodromous with nerves clearly visible on both surfaces, the first two or three starting at the base of the lamina and extending to the apex; other secondary venation (3–)5–7 per side and terminating at the veins originating from the base of the lamina; base of leaf pairs often forming a prominent ridge around the stem. Inflorescence terminal or on axillary side shoots, subumbellate, (1–) 3(–7)-flowered, flowers perfumed, bracts linear subulate, puberulent 3–6 mm long; pedicels 6–18 mm long, glabrous. Calyx glabrous, tube 2–3 mm long with 4 or 5 linear subulate teeth 4.5–10 mm long. Corolla hypocrateriform; pale pink on the outside, paler pink internally, tube 9–12 mm long with 4–6 lanceolate or narrowly lanceolate, acute lobes, 7–10 mm long. Stamens 2; anthers 3–3.5 mm long, on filaments 0.5–1 mm long, attached to the upper third of the corolla tube, slightly exerted.

Ovary 0.8–1.0 mm long; style about 10 mm long, slightly exerted from the corolla tube, heterostyly not observed; stigma slightly bilobed about 1.5 mm long. Fruit spherical to slightly ovoid, often paired (or single by abortion), 8–10 mm long by 9–11 mm broad, purple-black.

Phenology: Flowering period, November to January, fruits appearing December to April.

Additional specimens examined: Queensland. MORETON DISTRICT: Mt Glorious, Jan 1945, *Clemens s.n.* [AQ47857] (BRI); Brolga Park, 6km W of Woombye, Dec 1989, *Forster et al.*, PIF6146 (BRI); Black Shoot, Lower Beechmont, Nov 1993, *Holmes & Holmes s.n.* [AQ633577] (BRI); Tarlington Rd, Canungra, Sep 1994, *Holmes & Holmes s.n.* [AQ637677] (BRI); South branch of Kobbie Creek, Mt Glorious, 27°17'S 152°46'E, Apr 1997, *Phillips 12* (BRI)

Distribution and habitat: *Jasminum jenniae* has been recorded only from the Blackall, D'Aguilar and Beechmont Ranges. This disjunct distribution extends over 160 km between latitudes 26°38' and 28°05'S. Most records are from the Beechmont Range, in the upper catchments of Black Shoot, Armitage Creek, Back Creek (Killarney Falls) and Clagiraba Creek, between 240m and 475m altitude. Soil parent material is mainly basaltic or metasediments. In the Beechmont Range associated canopy species present at each of four sites included *Araucaria cunninghamii* Aiton ex D. Don, *Lophostemon confertus* (R.Br.) Peter G. Wilson & J.T. Waterh., *Premna lignum-vitae* (A. Cunn. ex Schauer) W. Piep., and *Olea paniculata* R.Br. Plants usually occur near the boundary between araucarian notophyll vineforest and eucalypt forest. Plants of restricted distribution recorded at two of four sites were *Baloghia marmorata* C.T. White, *Cryptocarya foetida* R.T. Baker, *Rhodamnia dumicola* Guymer & Jessup and *Alectryon reticulatus* Radlk. (J. Holmes data).

Diagnostic features: This species is distinguished readily by its ovate, coriaceous, glossy leaves with conspicuous and characteristic leaf venation, its linear subulate calyx teeth and its generally glabrous appearance. The petiole is articulated near the

base of the lamina. Infertile material resembles *Strychnos psilosperma* F.Muell. superficially.

Affinities: *J. jenniae* has close affinities with *J. aemulum* var. *brassii* P.S.Green which differs by its larger flowers (corolla tube 19–21 mm long, lobes 15–20 mm long), penninerved leaves, distinct indumentum and location of articulation in the middle of the petiole. Green's (1984) *Jasminum* sp. is also very similar and *Clemens s.n.* [AQ47857] (BRI) was included in this species by him. The species is said to have a 'fine and minutely, if thinly, velutinous indumentum on stem,

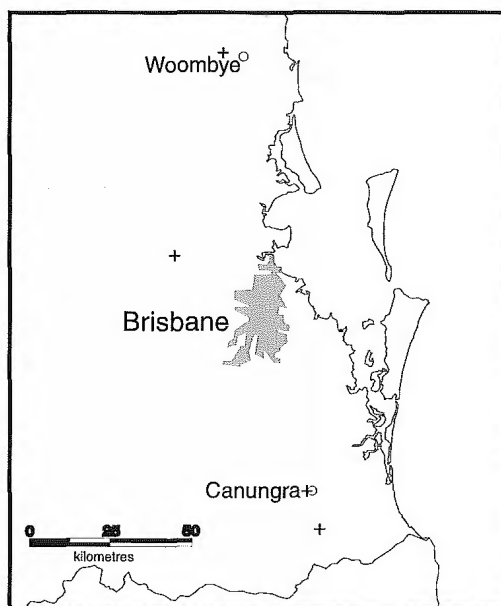


Figure 1. Distribution of *J. jenniae* in south eastern Queensland

petioles, lower surface of leaf, inflorescence, and calyx'. Articulation of the petiole occurs in the middle of or in the lower half. The other specimens cited by Green are from north Queensland and are a different species as yet undescribed. The key in Stanley and Ross (1986) also includes a *Jasminum* sp.1 which is in part the species described here and it is clear that they have followed Green's treatment and confused the two species. *J. jenniae* would key out at either *J. aemulum* R.Br. or *J. sp.* in Green's (1984) key. Several other species in the Australasian region have

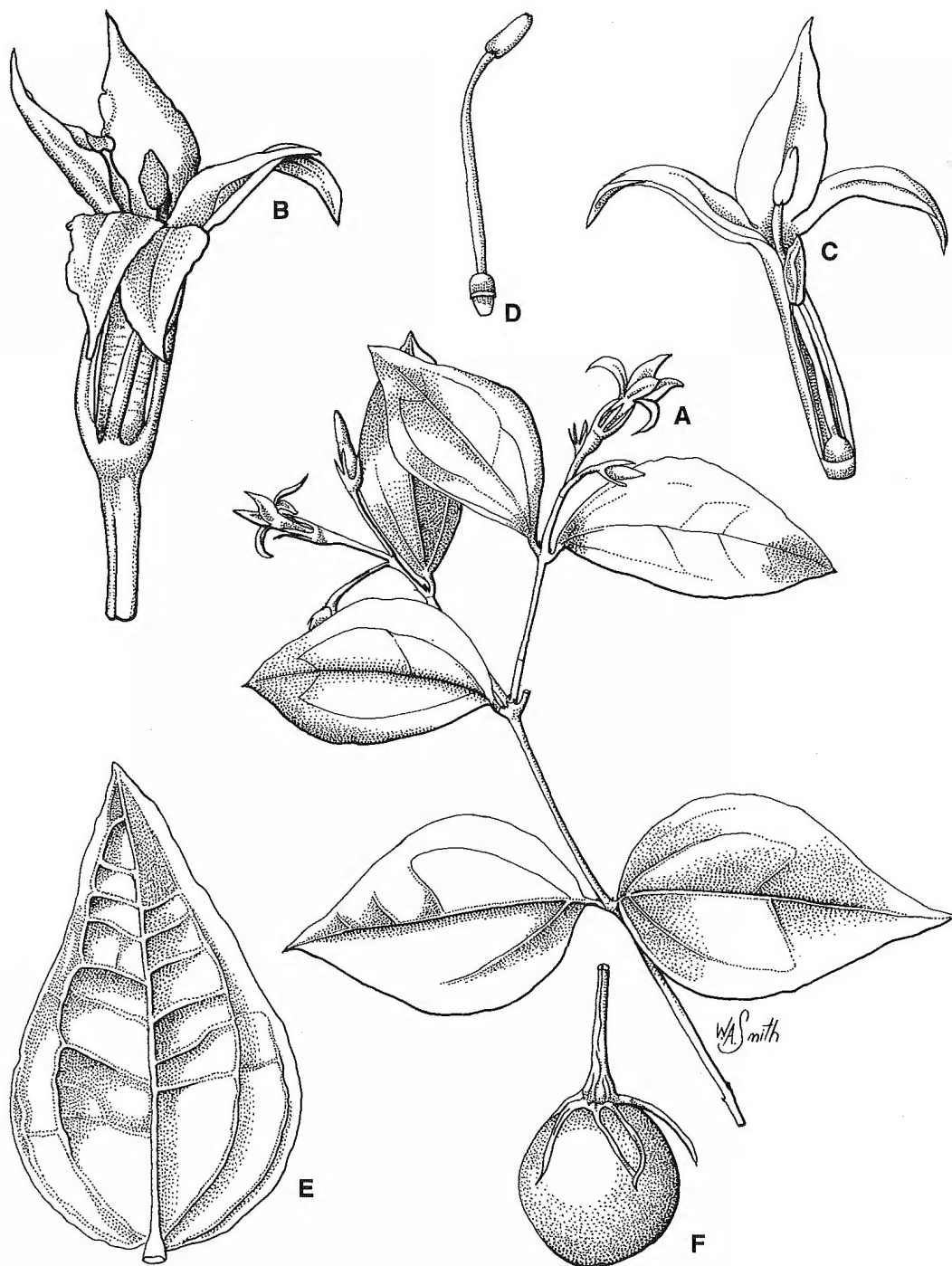


Figure 2. *Jasminum jenniae* A. habit $\times 1$. B. flower $\times 4$. C. section of flower $\times 4$. D. gynoecium $\times 4$ E. single leaf showing venation $\times 1.5$. F. fruit $\times 2$. (Phillips 143).

simple leaves. In *J. calcareum* F. Muell. the calyx lobes are blunt and the leaves are ovate to linear-lanceolate and in *J. simplicifolium* the leaves are less than 1 cm wide and the calyx lobes are shorter, usually less than 5 mm long. *J. kajewskii* has corolla lobes longer than the tube, in *J. longipetalum* the calyx lobes are more or less triangular and in *J. molle* the calyx lobes are equal to or shorter than the tube. *J. magnificum* Lingelsh. from Papua New Guinea differs in having wider calyx segments and short calyx lobes and much larger flowers and *J. papuasicum* Lingelsh. has pinnately veined leaves. New Caledonian species (Green 1962) with simple leaves are distinct and differ in the details of the calyx lobes which are generally shorter.

Conservation Status: By IUCN (1994) criteria B1 and C, *J. jenniae* is Endangered (EN). The population recorded in the Beechmont Range comprises about 550 plants. Only a few have been recorded elsewhere.

Etymology: The species is named after Jenny Holmes (nee Todd, b. 1952) to recognise her contribution to the knowledge of the flora of south east Queensland and northern New South Wales. During systematic geographic surveys of vine forests she has collected numerous significant specimens.

Key to the *Jasminum* species in S. E. Queensland

1. Leaves simple (1-foliolate) 2
 Leaves 3-foliolate 3
2. Stems, petioles and undersides of leaves glabrous to finely
 puberulent; leaves 2–5 cm wide; calyx lobes 4 or 5, linear-subulate,
 4–10 mm long **J. jenniae**
 Stems, petioles and undersides of leaves glabrous or with a few hairs,
 leaves less than 1 cm wide; calyx lobes up to 4 mm long,
 rarely 5 mm long **J. simplicifolium**
3. Stems, petioles and leaves pubescent-tomentose; inflorescences mostly
 1–5-flowered **J. dallachii**
 Stems, petioles and leaves glabrous or minutely puberulent;
 inflorescences mostly 5–50-flowered **J. didymum**

Acknowledgements

We thank Dr. G. P. Guymer for provision of facilities at BRI for one of us. Les Pedley provided the Latin diagnosis. Sue Phillips made collections of flowering material of this species from the type locality for the authors.

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The seedling of *Cassytha glabella* R.Br.

H. Trevor Clifford

Summary

Clifford, H. Trevor (1999). The seedling of *Cassytha glabella* R.Br. *Austrobaileya* 5(2) 345–347. *Cassytha glabella* R.Br. is described with special reference to the cotyledons. Seedlings are cryptocotylar and seed germination is epigeal with the remains of the diaspore covering the tip of the plumular shoot.

Keywords: *Cassytha glabella* R.Br.

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Introduction

The seedlings of *Cassytha glabella* are unusual in several respects which may help account for the inaccuracies in the published descriptions of those of *C. melantha* R.Br. (Ewart 1919, 1930) and *C. paniculata* R.Br. (McLuckie & McKee, as *C. pubescens* R.Br. 1954). As with those of other species of Lauraceae, the seedlings are cryptocotylar but differ from them in that the remains of the diaspore with its enclosed seed remnants is usually retained on the stem apex of the young seedling rather than being attached laterally to the shoot.

Such epigeal behaviour is characteristic of many cryptocotylar species and was first described by Müller (1887) for *Myristica bicuhyba* which he encountered in Brazil. Furthermore, the cotyledons of *Cassytha* like those of many other durian-type seedlings, as they are often known, separate from the axis at an early stage of seedling growth (Ng 1978). The young shoot, with its apex capped by the remains of the diaspore superficially resembles a young seedling of *Allium* but the presence of scale leaves on the apparent cotyledon confirms that it is a stem. Careful inspection of the stem also reveals the presence of a pair of opposite scars some distance below the first scale-leaf. These scars mark the position of the cotyledonary node.

Fruit and Seed

The diaspore is a superior drupe, embedded in but free from, a fleshy hypanthium which

derives from the post anthesis expansion of the floral receptacle. There is only one seed in each drupe and this develops from a solitary pendulous ovule (Sastri 1962). The embryo has a very short axis and two massive, tightly appressed plano-convex, peltate (Figs 1C, 1D), pale-green cotyledons. As with other laurals the mature seed lacks endosperm (Cronquist 1981).

Seedling

The initial stages of germination are marked by a slight rupturing of the fruit wall followed by the emergence and growth of the hypocotyl to a length of several centimetres with little concomitant growth of the radicle. From the base of the hypocotyl, which is somewhat swollen, there develop several adventitious roots which anchor the plant in the soil (Figs 1A, 1B). Once the seedling has become established the plumule expands and after a few months the roots decay, at which time if the seedling has not formed haustoria on a suitable host it dies.

Extension of the plumular bud does not result in its escape from the seed. Instead, as the lowermost internodes of the shoot elongate, its apex remains enclosed between the cotyledons which are themselves retained within the remnants of the diaspore.

Due to the abscission of the very narrow cotyledon petioles at the site of their attachment to the stem, the remnants of the diaspore are often carried aloft on the tip of the shoot (Fig. 1B).

The position of the cotyledonary node on the axis is indicated by the pair of scars which mark the junction of the hypocotyl and epicotyl (Figs 1C, 1D).

Rarely, the diaspore wall ruptures extensively in which circumstance its remnants may be shed thereby exposing one or both cotyledons still attached to the seedling (Figs 1A, 1C, 1D).

Discussion

The failure of Ewart (1919, 1930) to interpret correctly the structure of *Cassythia melantha* R.Br. seedlings is difficult to understand because Bentham (1870), with whose work he

was quite familiar, gave an excellent description of the embryo.

Furthermore, Bentham summarised the earlier literature in which the seed of this species was initially described as endospermic but later recognised to be non-endospermic with massive fleshy cotyledons. In his description of the family Brown (1810) not only referred to the cotyledons as large and plano-convex but noted that they were peltate, and stressed that his description was the result of direct observation.

It may be that Ewart (1919) was led into the error of assuming the seed was endospermic because he expected that since *Cassythia* was a

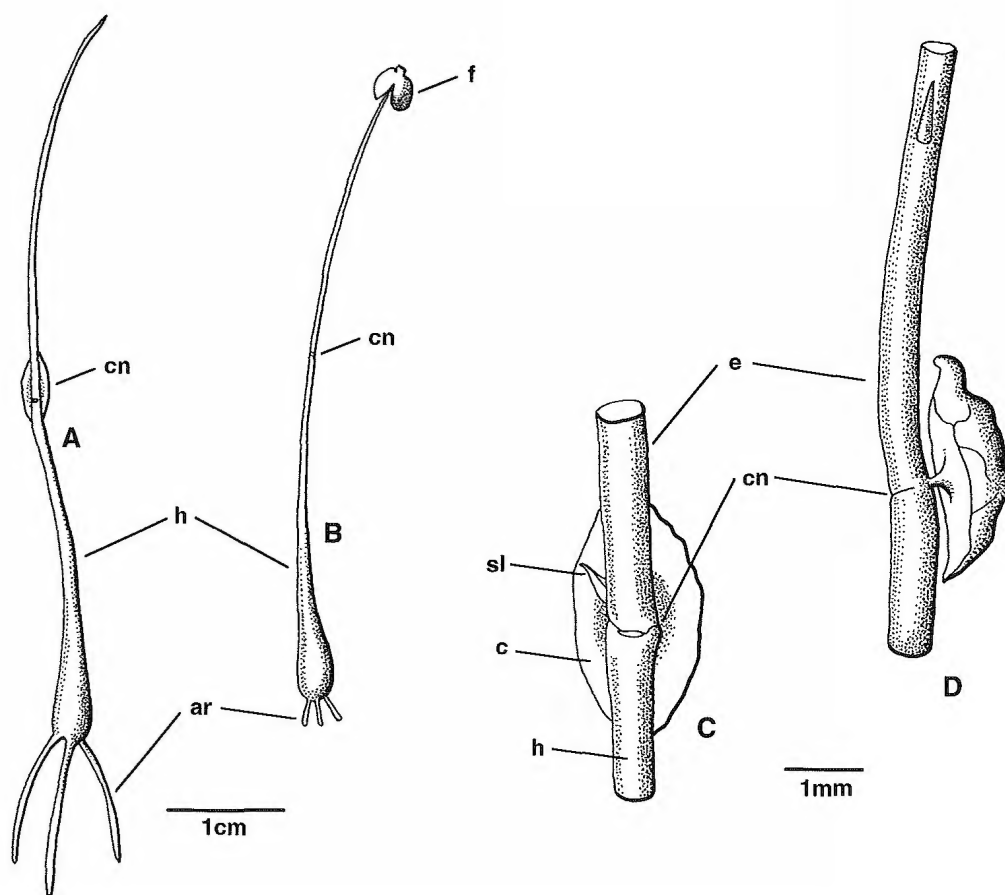


Fig. 1. Seedlings of *Cassythia glabella* A & B. Habit sketches; C & D. Details of cotyledonary node. ar, adventitious root; sl, scale-leaf; c, cotyledon; cn, cotyledonary node; f, remains of diaspore; e, epicotyl; h, hypocotyl.

twining leafless parasite, its embryo like, those of many other parasitic groups would lack cotyledons (Cronquist 1981). However, this explanation does not absolve him from failing to notice the scars marking the position of the cotyledonary node on the seedling axis. Furthermore, his assertion that the 'endosperm' is absorbed by the stem tip is not supported by his illustration in which there is no indication that digestion has occurred even though the seedling is well developed.

Ewart's description was soon challenged by Hart (1925) who recognised the presence of cotyledons in *Cassytha* seeds and suggested that the pair of opposite scars below the first scale leaf 'may be the original points of attachment of the cotyledons'. In a later paper (Hart 1946) he returned to the subject of the morphology of *Cassytha* seedlings but did little more than confirm his original observations.

The scars marking the cotyledonary node were overlooked by McLuckie and McKee (1954) who failed to record them on their otherwise excellent drawings of the seedlings of *Cassytha pubescens*. Such an oversight by two such otherwise careful observers is difficult to understand especially as they went on to follow Ewart (l.c.) and described the embryo of the species as acotyledonous.

The cotyledon scars were correctly recognised by Clifford (1987) but as did Kostermans (1957) and Weber (1981) he referred to the remnants of the diaspore covering the plumular axis as a seed. All three writers thereby lapsed into the common rather than the technical usage of the term.

The seedlings of all three *Cassytha* species studied are similar and differ in only minor respects from those of other Lauraceae. Seedling morphology therefore supports the view of Sastri (1962), based largely on embryology, that there is no justification for segregating the genus into a separate family as proposed by Bartling (in Lindley 1833) or subfamily as proposed by Kostermans (1957).

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A checklist of bryophytes of the wallum habitat of south-eastern Queensland and north-eastern New South Wales

J. Windolf

Summary

Windolf, J (1999). A checklist of bryophytes of the wallum habitat of south-eastern Queensland and north-eastern New South Wales (*Austrobaileya* 5(2) 349-352). A descriptive analysis of the bryophytes occurring within the wallum environment, together with notes on their host/substratum, micro-habitat and occurrence in the adjacent bryophyte community is provided. Six moss and five liverwort species are recorded, and the most northerly known occurrence of the moss *Sphagnum australe* Mitt. is noted.

Keywords: Bryophytes, Wallum

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Introduction

The study reported on here was undertaken to provide information on the bryophyte species present in the wallum habitat of south-eastern Queensland and north-eastern New South Wales. Any previous studies in this specialist area have apparently not been reported in the literature, so it was considered to be a matter of some urgency, given the rapidly diminishing state of this unique habitat, that one be undertaken. Because of its pleasant climate and its proximity to large centres of population, the area encompassing the wallum is in increasing demand both as a tourist and recreational destination, and as a source of agricultural land, primarily for the cultivation of sugar cane. The physical inroads of urban development as well as of primary production, and their associated infrastructures such as roads and drainage, have contributed to severe modifications to the landform of the wallum via reduction of intact volume, altered watertables, the introduction of foreign species and the unnatural frequency of fire (Harold 1987, Windolf 1987a). Even those areas which have until now escaped actual destruction of their original habitats probably have a limited time in their native state.

What is wallum?

The wallum habitat is widely accepted as a narrow area of nutrient deficient wet heathland occurring immediately inland of the coastal

sand-dunes in south-eastern Queensland and north-eastern New South Wales, from Bundaberg in the north to Ballina in the south, although limited outliers occur as far north as Shoalwater Bay and southward to Port Stevens. It is characterised by shallow, sandy, acid (pH 3.5–4.0) soils, particularly deficient in nitrogen, phosphorous and trace elements, which, however, support a highly diversified heathland type vegetation. These soils overlie an impermeable organic sandstone which restricts drainage. This results in the watertable, except in extreme droughts, remaining relatively high. Variations in altitude are generally less than a metre, but even these create significant zonation patterns ranging from the deepest sections, which are either slow-moving drainage channels or shallow, closed lagoons, to relatively dry, open heathland. The surfaces of the depressions, which are usually covered by standing water, or at least remain moist throughout the year, are occupied by the reed-like sedges, *Baumea rubiginosa* and *Lepironia articulata*. The margins of these areas are often occupied by dense thickets of stunted (1–2 m in height) *Melaleuca quinquinervia*, a species which also occupies the occasional deeper stream, but which then tends to adopt a more normal growth pattern and form narrow belts of closed forest up to 10 m high. On the sloping sides of these depressions, there is a graduated floristic change as the elevation increases, passing through belts of *Leptospermum*, *Empodisma*, *Pultenaea*, *Xanthorrhoea* and

Boronia species to the highest level where the substratum is only seasonally waterlogged and the vegetation is more characteristic of open heathland. There it generally includes the species *Banksia aemula*, or “wallum” to the Aborigines, from which the habitat derives its name (Campbell, Sharpe & Windolf 1995, Windolf 1987a). This heathland then gradually changes into sclerophyll forest and shrubland which inhabits the adjoining sandy ridges.

Climate

The climate of the wallum is of the subtropical humid, east-coast type characterised by hot summers, mild winters and a clearly defined wet season. Annual rainfall varies from 1400 mm to 2000 mm, approximately half of which falls, on average, between the beginning of January and the end of April, but this is prone to wide variation, both in timing and magnitude. A limited number of frosts usually occur during June, July and August (Windolf 1987a).

Methodology

The research was conducted over a period of approximately five years and comprised the collecting of specimens and the recording of species, as well as the taking of notes on host/substratum relationships and habitats at various sites. Similar investigations were also carried out at the same time in adjacent areas with a view to determining whether the wallum bryophyte community was in any way unique, or exists merely as an extension of bryophyte communities in adjoining areas.

Collecting was principally carried out in the Wide Bay and Sunshine Coast regions in Queensland and around Ballina and Evans Head in New South Wales. Detailed studies were conducted in the Noosa, Peregian, Coolool region with general collecting being carried out in other areas.

Species list

The following species of bryophytes have been recorded for the wallum habitats of eastern Australia. Voucher specimens are housed in the Queensland Herbarium (BRI), the herbarium of the Hattori Botanical Laboratory (NICH),

and the author's private collection. The nomenclature and classification systems used are those published in *The Mosses of southern Australia* (Scott, Stone & Rosser 1976) for mosses, and *Australian Liverworts (Hepaticae): Annotated list of binomials and checklist of published species with bibliography* (Scott & Bradshaw 1986) for liverworts.

Mosses

Sphagnaceae

Sphagnum australe Mitt.

This species occurs along the margins of the wallum depressions, generally mixed with plants of *Lepironia articulata* which provide it with a protected and partially shaded micro-habitat. It is also recorded along the banks of water courses and man-made drains immediately adjacent to wallum areas. As it appears to have been spread to these sites by human intervention, it is assumed that the wallum is its original habitat in this region. It is unknown in Queensland outside of the wallum and immediately adjacent areas, although it may be more widespread than this limited recording suggests.

Ditrichaceae

Ditrichum difficile (Dub.) Fleisch.

This species is found occasionally on bare earth in the higher, drier areas of the wallum, particularly on soil which has been compressed, such as along vehicle tracks. This indicates introduction by humans, so this species should probably be seen as a randomly introduced species in the wallum. It is common in a variety of habitats throughout eastern Australia.

Dicranaceae

Leucobryum candidum (P.Beauv.) Wils.

This species occurs on dead, decaying timber and occasionally on bare soil in the drier areas. It is common in a variety of habitats throughout eastern Australia.

Campylopus introflexus (Hedw.) Brid.

The habitat of this species is very similar to that of *Ditrichum difficile*. It is relatively common throughout eastern Australia.

Orthotrichaceae

Macromitrium aurescens Hainpe

This species is limited, occurring on the bark of *Casuarina* sp. among the *Melaleuca* thickets. These thickets, which are often quite dense, provide a habitat similar to that on the inland side of the coastal sand-dunes, which they often adjoin, and where *Macromitrium aurescens* is also present on the bark of both *Casuarina* and *Banksia* species (Vitt & Ramsey 1985).

Bryaceae

Bryum billardieri Schwaegr.

This species is occasionally found on sand in areas which are flooded periodically, but dry out. It is relatively common in both the wallum and surrounding areas.

Liverworts

Ricciaceae

Riccia cartilaginosa Steph.

This species is rare, but is found occasionally on bare soil patches which are periodically flooded. These patches develop a heavier texture than is usual in the sandy wallum soils due to the accumulation of fine silts and organic detritus in the lowest altitudes. This species has not been recorded locally from other habitats outside of the wallum.

Lepidoziaceae

Kurzia compacta (Steph.) Grolle

This species is found only, on peat at the base and on paper-like absorbent bark on the lower parts of *Melaleuca quinquinervia* trees. This substratum remains damp for long periods because of the sponge-like effect of drawing up water from between the tree bases. As these sites occupy the lowest elevations in the wallum habitat they remain damp except in periods of extreme drought. Outside of the wallum, this species is relatively plentiful on dead decaying

timber in dense riverine rainforests and also at the margins of closed *Melaleuca* swamps in adjacent areas (Windolf 1985).

Zoopsis argentea (J.D.Hook. & Tayl.) J.D.Hook. & Tayl.

The habitat of this species is very similar to that of *Kurzia compacta*, but it is a much rarer species, both in the wallum and in adjacent areas (Windolf 1985).

Frullaniaceae

Frullania rostrata (J.D.Hook. & Tayl.) J.D.Hook. & Tayl.

This species occurs only very occasionally on the bark of several *Banksia* species, usually in open shrubland or on isolated plants in the open. It is also found in a variety of similar habitats throughout the region, but is never common.

Lejeuneaceae

Lejeunea flava (Sw.) Nees subsp. *orientalis* Schust.

This species is found on the bark of a variety of hosts, and on dead timber in suitable micro-habitats. It is very common in a wide range of habitats in surrounding areas (Windolf 1985), but is not particularly so in the wallum.

Discussion

It is obvious from the small number of species recorded that bryophytes play only a minor role in the overall biology of the wallum. However, in view of the unusual nature of the habitat the recording of the species and notes on their occurrence produce an interesting extension of knowledge in the field of bryophyte ecology, as well as setting a baseline list of species present in this threatened environment.

Although small the bryophyte flora contributes to the overall biodiversity of the region. Of particular significance is the presence of *Sphagnum australe* which was found only in the wallum and not in adjacent areas. Although of limited extent, it appears to be well established and native to this habitat.

Its discovery in the Coolum/Peregrine area of south-eastern Queensland is apparently the first record of this species for Queensland and thus of its most northerly occurrence in Australia, normally being associated with the more temperate regions of Australia, New Zealand, South America and South Africa (Scott, Stone & Rosser 1976). With this one exception the taxa present all occur – albeit in varying degrees – in adjacent habitats and their presence in the wallum should be seen as nothing more than a part of their natural distribution.

Acknowledgments

Acknowledgments are due to Dame Ella Campbell, Dr Jessica Beever, Dr Helen Ramsey and the late Dr Sinski Hattori who have all assisted in the identification of specimens from wallum habitats for me at some time. Also to the Chief Botanist and staff of the Queensland Herbarium for making their collection available, and to my wife Frances and Philip Sharpe for their ongoing encouragement and company in the field.

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Vanguerieae A. Rich. ex Dum. (Rubiaceae) in Australia, 1. *Everistia* S.T.Reynolds & R.J.F.Hend.

S. T. Reynolds & R. J. F. Henderson

Summary

Reynolds, S.T. & Henderson, R.J.F. (1999). Vanguerieae A.Rich. ex Dum. (Rubiaceae) in Australia, 1. *Everistia* S.T.Reynolds & R.J.F.Hend. *Austrobaileya* 5(2): 353-361. The Australian representatives of tribe Vanguerieae have been revised. Three genera, viz. *Everistia* S.T. Reynolds & R.J.F.Hend. gen. nov. (one species), *Cyclophyllum* Hook.f. (9 species) and *Psydrax* Gaertn. (23 species) occur here. Australian plants formerly included in *Canthium* Lam. belong to these genera. In this paper, the following new combinations are made for some of them: *Everistia vacciniifolia* (F.Muell.) S.T.Reynolds & R.J.F.Hend. (*Canthium vacciniifolium* F.Muell.), *Everistia vacciniifolia* var. *nervosa* S.T.Reynolds & R.J.F.Hend. and *Everistia vacciniifolia* f. *crassa* S.T.Reynolds & R.J.F.Hend. All recognised taxa of *Everistia* are described, and relevant keys, distributional maps and line drawings are provided.

Keywords: *Everista*, Vanguerieae, Rubiaceae, key, taxonomy, *Everista vacciniifolia*, Australian flora, Queensland, New South Wales.

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Introduction

Recent studies evaluating the genus *Canthium* Lam. in Africa have resulted in the splitting of the genus and reinstatement of some of the genera previously combined with *Canthium*. Bridson (1985) reinstated the genus *Psydrax* Gaertn. and included the African species and one Australian species (*P. lamprophylla* (F.Muell.) Bridson) in it. She later (Bridson 1987, p. 616) suggested transfer of several other species to this genus. She characterised the New Caledonian genus *Cyclophyllum* Hook.f. and discussed it as one of several groups of Vanguerieae allied to *Pyrostria* Comm. ex Juss. noting that "the question of whether recognition of *Cyclophyllum* should be generic or at an infrageneric rank of *Pyrostria* (or even *Canthium*) remains to be settled". Bridson (1992) noted that neither *Canthium* sensu stricto nor any species

approaching it occurs in Australia, Papuasias or the Pacific Ocean basin, and that taxa from this region previously included under the name *Canthium* Lam. are referable to either *Psydrax* Gaertn. or *Cyclophyllum* Hook.f.

This study confirmed that the majority of the Australian species of Vanguerieae are referable to *Psydrax* or *Cyclophyllum* as they agree quite well with others of those genera from outside Australia. An exception is *Canthium vacciniifolium* F.Muell. This species differs from related Australian species by its deeply 2-lobed, ovoid stigma, which has a convex base, much-branched habit, its small usually nerve-less leaves and its 1-3-flowered umbelliform inflorescences with delicate flowers. It is therefore treated as belonging to a distinct new genus described as *Everistia* in this account.

Taxonomy

Key to genera of tribe Vanguerieae in Australia

1. Stigma oblongoid, concave at the base; style (usually much) exceeding the corolla tube; inflorescences usually of branched pedunculate cymes, usually with secund flowers and a long-stalked central flower near branch forks **2. Psydrax**
 Stigma capitate or ovoid, convex at the base; style as long as or slightly exceeding the corolla tube; inflorescences of sessile or short-peduncled umbelliform cymes **2**
2. Stigma ovoid, deeply 2-lobed; cymes pedunculate, 1–3-flowered; corolla tube delicate, with a band of reflexed filiform hairs at throat; anthers on distinct filaments, lacking dark coloured connective tissue dorsally; plants usually much branched (intricately branched); leaves nerveless or obscurely nerved **1. Everistia**
 Stigma capitate, obscurely 2-lobed; cymes sessile or pedunculate, 1–12-flowered; corolla tube fleshy, usually with dense long moniliform hairs projecting from mouth, but lacking reflexed hairs; anthers subsessile, with dark coloured connective tissue dorsally; plants few-branched; leaves conspicuously nerved **3. Cyclophyllum**

Notes: Only *Everistia* is treated in this paper; *Cyclophyllum* and *Psydrax* will be dealt with in forthcoming issues of *Austrobaileya*.

This study is based mostly on herbarium material. Measurement ranges given for leaves, inflorescences, flowers and fruit are based on dried, fresh or spirit material.

In the citation of specimens, only herbaria whose specimens have been seen are listed; districts are provided only for Queensland collections.

Everistia S.T.Reynolds & R.J.F.Hend. **gen. nov.** a *Psydrace* Gaertn. et *Cyclophyllo* Hook.f. stigmae profunde bilobo ad stylum per basem convexam affixo, habitu multo ramoso, foliis parvis plerumque enervibus, floribus delicatis differt. **Typus:** *Everistia vacciniifolia* (F.Muell.) S.T.Reynolds & R.J.F.Hend. (*Canthium vacciniifolium* F.Muell.)

Shrubs or small trees, erect, scandent or prostrate, usually much branched; branchlets (especially when young) usually spinose; spines usually at tips of branchlets or supra-axillary or leaf opposed, entire or sometimes forked. Leaves nerveless or obscurely nerved. Inflorescences umbelliform, with 1–3 flowers

in fascicles on short slender peduncles; pedicels exceedingly slender; flowers 4- or 5-merous; corolla with short or long tube, with reflexed hairs at throat; corolla lobes acute to acuminate and sometimes long attenuated at apex; stamens exserted; anthers oblongoid, dorsifixed; style as long as or longer than corolla tube; stigmatic knob ovoid, fleshy, with two, broad, ± flattened, ovate, recurved lobes, convex at the base. Fruit ellipsoidal or obovoid, slightly fleshy, blackish when ripe, 2-lobed; pyrenes hemispherical, adaxially flattened, woody, exceedingly rugose abaxially; cotyledons borne more or less parallel to ventral face of seed.

Distribution: Endemic in Australia; represented by one very variable species.

Diagnostic characters: *Everistia* is characterised by its much-branched habit (the divaricate intricately branched branches often forming an entangled mass), slender branchlets which are often spinose, obscurely nerved or nerveless leaves, fragile 1–3-flowered umbelliform inflorescences, delicate 4- or 5-merous flowers and deeply 2-lobed stigma.

Affinities: *Everistia* resembles *Psydrax* Gaertn. and *Cyclophyllum* Hook.f. in the placement of the cotyledons and is closely

related to these genera. It resembles *Psydrax* in its corolla (with a band of reflexed hairs at the throat of the corolla tube), exserted erect stamens and umbelliform inflorescences. This type of inflorescence although not known in the species of *Psydrax* in Australia, is present in some African species of that genus (Bridson 1985). It resembles *Cyclophyllum* in its umbelliform inflorescence and stigma with convex base.

Etymology: This genus is named in honour of the late Dr Selwyn L. Everist, a former Director of the Queensland Herbarium (1954-1976), who gave us the opportunity to work in our particular field of botanical interest and who supported and encouraged many a botanist during his directorship at BRI. Dr Gordon Guymer, current Chief Botanist at BRI, is thanked for suggesting this name.

1. *Everistia vacciniifolia* (F.Muell.) S.T. Reynolds & R.J.F.Hend., *comb. nov.*

Canthium vacciniifolium F.Muell., Trans. Phil. Inst. Vict. 3: 47 (1859). **Type:** Queensland. SOUTH KENNEDY DISTRICT: Suttor River, *F. Mueller* s.n. (lecto, here designated: MEL [MEL 1538572]; isolecto: K).

Shrubs or small trees 1–7 m high, erect to scandent to prostrate; bark grey or creamy grey, smooth; trunk straight with spreading uniplanar or divaricately branched branches; branches and branchlets often intricately branched and forming an entangled mass giving the plant a rounded appearance; branchlets greyish-brown and with white streaks, glabrous or hairy with minute, spreading hairs, terete, slender, stiff, straight or sometimes flexuose or curved (sometimes recurved), spinose distally especially in young growth, with few scattered leaves or occasionally leaf-less and spinescent; spines bifurcate or entire, straight, often thickened at base, at tip of short leafless branchlets, leaf-opposed or supra-axillary; leaf lamina surfaces, stipules, petioles, peduncles, pedicels and calyx with minute spreading hairs

or glabrous. Petioles 0.5–2.0 mm long; stipules comparatively small, ovate, abruptly acuminate with a short folded lobe at apex, thick or thin, coriaceous; leaf laminae elliptic, obovate or suborbicular, 3.5–17.0 x 3.5–10.0 mm, obtuse or retuse at apex, obtuse, \pm truncate or acute at base, flat or recurved at margins, flat or slightly convex or concave and broadly channelled at midrib adaxially, thick or thin, coriaceous; adaxial surface shiny; abaxial surface dull; midrib slender, sometimes not apparent; lateral nerves in 1 or 2 pairs, obscure, very fine, arching, usually visible on abaxial surface, or nerves absent. Peduncles 0.5–5.0 mm long; bracts minute, ovate. Flower buds 4.0–7.0 (–9.0) mm long, slender, sometimes fleshy, with apex obtuse and apiculate or acuminate; pedicels 0.5–5.0 mm long; calyx 1.0–1.25 mm long; limb 4 (or 5)-denticulate with minute ovate lobes; corolla yellow, 5.0–9.0 mm long; tube slender, dilated or inflated at throat, 3.0–4.5 mm long, c. 2.5 mm wide at mouth, sparsely hairy with a band of reflexed filiform hairs at throat; lobes erect or recurved, ovate or lanceolate, 2.5–5.0 x 1.0–2.0 mm, with apex acute or subobtuse and apiculate or subacuminate or acuminate and usually with a long recurved acumen, hairy, often papillose near apex; stamens exserted; filaments 0.75–2.5 mm long; anthers oblongoid, 1.0–2.5 mm long; style with stigma 4–8 mm long, exserted or included. Fruit 4.0–7.0 x 4.0–7.0 mm, smooth, usually topped by remnants of calyx.

Notes: *E. vacciniifolia* is readily distinguishable by its much-branched habit, stiff, slender, often spinose branchlets, straight unbranched or bifurcate spines, small, elliptic or obovate, faintly nerved or nerveless leaves, small, fragile, shortly pedunculate 1–3-flowered umbelliform inflorescences, and obtuse- to acuminate-tipped flower buds.

The species as circumscribed here is extremely variable in its aspect, branching, shape and texture of leaf laminae and in the shape of its flower buds. Two varieties are recognisable; these are connected by intermediate forms.

Key to varieties of *Everistia vacciniifolia*

1. Leaves 3.5–9.0 x 3.5–8.0 mm; lamina slightly concave or flat, coriaceous, thick; lateral nerves not apparent; flower buds 4.0–7.0 mm long, obtuse or abruptly narrowed and apiculate, or rarely subacuminate at apex; peduncles and pedicels 0.5–2.0 mm long; usually much-branched shrubs or small trees with divaricate branching . . . (a) ***E. vacciniifolia* var. *vacciniifolia***
 Leaves 12.5–17.0 x 9.0–10.0 mm; lamina flat, coriaceous, thin (drying very thin); lateral nerves distinct; flower buds 7.5–9.0 mm long, long acuminate at apex; peduncles and pedicels 2.0–5.0 mm long; usually small trees with planar layered branching (b) ***E. vacciniifolia* var. *nervosa***

(a) *E. vacciniifolia* var. *vacciniifolia*

Shrubs, erect or prostrate, usually much branched with divaricate branched branchlets; branchlets densely leafy and straight or recurved distally, or with a few scattered leaves and spinose, or sometimes leafless when short and spinescent. Leaf laminas flat or slightly concave, with flat or recurved margins, thick, coriaceous, nerveless or rarely obscurely nerved, with surfaces minutely hairy or glabrous. Peduncles slender, 0.5–2.0 mm long;

flower buds 4.0–7.0 mm long, slightly fleshy, obtuse and apiculate or abruptly narrowed and crowned by minute lobes at apex; corolla tube slender, slightly dilated or inflated at throat; lobes obtuse, apiculate or sometimes subacuminate.

This variety varies greatly in the shape and texture of its leaf laminas. Two forms of it are formally recognised here. These forms occasionally overlap in their characters.

Key to forms of *Everistia vacciniifolia*

1. Leaf laminas flat or slightly concave or deeply grooved along the middle adaxially; margins flat or recurved; adaxial surface slightly shiny, hairy or glabrous; nerves absent (i) ***E. vacciniifolia* forma *vacciniifolia***
 Leaf laminas flat; margins flat; adaxial surface shiny, glabrous; nerves obscure or absent (ii) ***E. vacciniifolia* forma *crassa***

(i) *E. vacciniifolia* f. *vacciniifolia*

Shrubs with divaricate branching; branches often much branched and forming an entangled mass; branchlets distally straight or curved; leaf laminas with nerves not apparent, minutely hairy or glabrous. Flower buds 4.0–5.5 mm long, usually obtuse and shortly apiculate at apex; corolla tube 2.5–3.0 mm long, slightly dilated at throat; lobes 2.5–3.0 x 1.0–1.5 mm, subobtuse or acute. (Fig. 1A)

Representative specimens: Queensland. LEICHHARDT DISTRICT: June Tableland, 80 km N of Dingo, Jun 1972, *McDonald* 554 (BRI); Kaiuroo, 23°05'S, 149°18'E, Feb 1993, *Fensham* 713 (BRI); Murphy Range, 57 km from Taroona on Glenhaughton road, 25°25'S, 149°30'E, Sep 1992, *Forster* PIF 11226 & *Sharpe* (BRI); ditto, Oct 1993, *Forster* PIF 14111 & *Holland* (BRI). PORT CURTIS DISTRICT: Fitzroy River, May 1863, *Dallachy* s.n. (MEL); Double Head Yeppoon, Emu

Park, May 1970, *Telford* 1700 (CANB). BURNETT DISTRICT: Monogorilby, Mundubbera Shire, 26°01'S, 151°01'E, Dec 1984, *Forster* PIF 344B (BRI). DARLING DOWNS DISTRICT: Chinchilla, May 1946, *White* 1122 (BRI, CANB). MORETON DISTRICT: Brisbane River, *Hill* s.n. [MEL 15385711] (MEL).

Distribution and habitat: Central and southern Queensland, between Suttor and Brisbane Rivers; usually in dry scrubs especially in or at the edge of Brigalow (*Acacia harpophylla* F.Muell. ex Benth.) scrubs, on dry ridges, jump-ups, slopes and gullies, on sandy stony soils. Map 1.

Notes: This form varies greatly in its aspect, branching, leaves and shape of flower buds. Specimens from along the Fitzroy, Dawson, Burnett and Brisbane Rivers usually have robust stiff branchlets, which are mostly arching especially towards their tips or are

short and sometimes spinescent, small elliptic or orbicular, \pm concave leaf laminas with usually recurved margins, shortly stalked inflorescences and obtuse and apiculate flower buds. Specimens from other areas, however, have thicker, narrow or broad, flat leaf laminas and usually more slender and longer flower buds; some of these approach *E. vacciniifolia* f. *crassa*, and probably represent intergrades between the forms.

Typification: Mueller (1859) cited "Barren scrubby localities near the Burdekin, Suttor, McKenzie, Dawson and Burnett rivers" in his protologue of *Canthium vacciniifolium*. Only one of the collections on which Mueller apparently based his description, viz. Suttor River, leg. *Mueller* s.n. (K, MEL), has been seen in this study. The MEL specimen of this collection is here chosen as lectotype of this species' name. The specimen, which is in flower, agrees well with Mueller's protologue description.

- (ii) ***E. vacciniifolia* f. *crassa*** S.T.Reynolds & R.J.F. Hend., **forma nov.** a *E. vacciniifolia* (F.Muell.) S.T.Reynolds & R.J.F.Hend. f. *vacciniifolia* laminis foliorum crassis differt. **Typus:** Queensland. PORT CURTIS DISTRICT: Neerkol Creek, *Bowman* 21 (holo: MEL [MEL 1538080]).

Shrubs with divaricate or planar layered branching; branchlets rarely arching distally; leaf laminas with nerves and midrib not apparent or rarely visible but obscure, glabrous. Flower buds 5.5–7.0 mm long, abruptly narrowed at apex and crowned by short narrow lobes; corolla tube 3.5–4.5 mm long, usually inflated at throat; lobes 2.5–3.0 x c.1.5 mm, subacuminate.

Representative specimens: Queensland. COOK DISTRICT: 40 Mile Scrub, 18°15'S, 141°45'E, Feb 1972, *Hyland* 5874 (BRI). BURKE DISTRICT: Mt Walker, near Hughenden, 20°55'S, 144°11'E, Apr 1935, *Blake* 8442 (AD). NORTH KENNEDY DISTRICT: Mingela Bluff, 19°53'S, 146°45'E, Jan 1992, *Forster* PIF 9416 & *Bean* (BRI). MITCHELL DISTRICT: Cuttsy's Springs, about 30 miles (48 km) ESE of Yalleroi, Feb 1940, *Everist* 1965 (BRI); Jericho, Mar 1920, *Francis* 106 (BRI). SOUTH KENNEDY DISTRICT: Near Glendon, Sep 1950, *Smith* 4625 (BRI); 7 km NE of Belyando Crossing on Gregory Development Road, 21°30'S, 146°48'E, Jun 1992, *Thompson* 460 & *Sharpe* (BRI). PORT CURTIS DISTRICT: Gainsford, date unknown, *Bowman* s.n. (MEL) (see below).

Distribution and habitat: Northern and central western Queensland; in deciduous vine thickets on rocky hillsides and on sandstone. Map 1.

Notes: This form is characterised by its flat, thick leaf laminas with slightly shiny adaxial surfaces, long flower buds and subacuminate corolla lobes. It resembles *E. vacciniifolia* var. *nervosa* in its planar layered branching, flat leaf laminas and long flower buds and corolla, but differs from that by its stout branchlets with closely arranged leaves, thick, usually nerveless leaves, and comparatively short peduncles and pedicels. *E. vacciniifolia* var. *nervosa* is a sparsely branched plant with leaves usually widely spaced on the branchlet, leaves thin and distinctly nerved, flower buds slender and usually slightly fusiform, and peduncles and pedicels comparatively long.

The label attached to Bowman's unnumbered specimen of this taxon in MEL [MEL 1538079] is annotated 'Gainsford', whereas the label attached to the specimen is annotated 'Herbert Creek'. This specimen appears to be from the same collection as a specimen in MEL labelled as collected at Herbert Creek by Bowman [MEL 1538069]. Both Gainsford and Herbert Creek are close to Neerkol Creek (Blake 1955), where the holotype was collected.

Etymology: The epithet *crassa*, Latin for thick, refers to the comparatively thick leaf laminas in this form.

- (b). ***E. vacciniifolia* var. *nervosa*** S.T.Reynolds & R.J.F.Hend., **nom. & stat. nov.**

Canthium microphyllum F.Muell., *Fragm.* 2: 134 (1861). **Type:** Queensland. MORETON DISTRICT: Brisbane River, Moggill Scrub, *F. Mueller* s.n. (lecto, here designated: MEL [MEL 1538076]; isolecto: K).

Small trees or large shrubs, usually with a straight slender trunk and spreading layered branching; branchlets more or less borne in the same plane as the main branches or occasionally suberect with divaricate branches. Leaves usually widely spaced on

branchlets; laminae flat, glabrous, coriaceous, thin (drying very thin), slightly shiny on adaxial surface; midrib and nerves usually visible on the abaxial surface; lateral nerves in 1 or 2 pairs, very slender, slightly arching. Peduncles and pedicels filiform; flower buds fragile, 7.5–9.0 mm long, with a slender tube and acuminate lobes at apex; corolla tube slender, 3.5–4.5 mm long; lobes lanceolate, 3.5–5.0 mm long, acuminate with a long recurved acumen at apex. (Fig. 1B)

Representative specimens: **Queensland.** PORT CURTIS DISTRICT: Dan Dan Scrub, State Forest 53, Calliope Shire, Dec 1984, Gibson 699 (BRI). WIDE BAY DISTRICT: NW base of Boogooramunya, State Forest 648, 25°51'S, 152°08'E, Jan 1989, Forster PIF4913 (BRI); Mt Eerwah, about 4 km W of Eumundi on Kenilworth road, 25°28'S, 152°55'E, Dec 1987, Sharpe 4759 (BRI); 1 km S of barracks, Oakview State Forest 220, 26°07'S, 152°20'E, Dec 1988, Forster PIF4861 & Orford (BRI). BURNETT DISTRICT: Yarraman State Forest (State Forest 289), Neumgna, 26°56'S, 151°49'E, King Logging Area, just N of junction of Cooyar-Maidenwell road and New England Highway, Dec 1987, McDonald 4135 & Williams (BRI). MORETON DISTRICT: McIntyre Scrub, 6 km W of Woombye, 26°39'S, 152°54'E, Jan 1990, Forster PIF6204, Bird & Bean (BRI); Woongaroo Creek, S of Goodna, 27°40'S, 152°45'E, Nov 1983, Williams 83021 (BRI); Moggill, Brisbane, 27°3'S, 152°5'E, Feb 1984, Oakman s.n. (BRI); Norman's Creek, Moreton Bay, Jul 1843, Leichhardt s.n. [NSW 193686] (NSW); Mt French, 6 km SW of Boonah, 28°02'S, 152°40'E, Jan 1983, Telford 9079 & Butler (CANB). **New South Wales.** Totties Mount, Ramornie, Jul 1922, Blakely & Shiress s.n. [NSW 193685] (NSW); Pikapene State Forest, about 12 miles (19 km) directly SE of Tabulan, Nov 1966, Hayes, Turner & McGillivray 2649 (BRI); ditto, Apr 1969, Pickard & Blaxell 255 (NSW); MacLeay River, date unknown, Beckler s.n. [MEL 1538073] (MEL); Broken Bago State Forest, about 9 km SW of Wauchope, Nov 1980, Coveny 10922 (NSW).

Distribution and habitat: Central and southeastern Queensland to Hunter River, New South Wales; usually in Araucarian microphyll vine forests, on reddish coloured soils; along creeks and rivers, and on slopes. Map 1.

Notes: *E. vacciniifolia* var. *nervosa* is readily recognisable by its usually layered branching spreading out from a single stem, finely nerved leaf laminae, leaves widely spaced on branchlets, and by its long, fragile, acuminate flower buds and acuminate corolla lobes.

The leaves of this variety are variable. Specimens with thin, finely nerved leaves are typical whereas specimens with comparatively thicker leaves and obscure nerves approach *E. vacciniifolia* f. *crassa*. The latter taxon, however,

differs from them in its shorter peduncles and pedicels which are 0.5–2.0 mm long, and obtuse- or acute-tipped flower buds.

Canthium microphyllum F.Muell. was combined with *C. vacciniifolium* F.Muell. by both Bentham (1867) and Mueller (1875) without any formal infraspecific recognition. It is recognised at varietal level here because although the taxa intergrade, their extremes are very distinctive.

Typification: Mueller (1861) cited three collections, viz. Brisbane River, Hill s.n., ditto, Mueller s.n., and Rockhampton, Thozet s.n., with his diagnosis of *Canthium microphyllum*. Of these, Mueller's collection from Brisbane River, annotated 'Moggill Scrub, Brisbane River', at MEL [MEL 1538076] is here chosen as lectotype of this name. The lectotype, which is in flower, agrees well with the original description.

The syntype from Brisbane River collected by Hill [MEL 1538571] is *E. vacciniifolia* var. *vacciniifolia*, whereas the syntype from Rockhampton collected by Thozet s.n. [MEL 1538078] is also *E. vacciniifolia* var. *nervosa*.

Etymology: The new epithet *nervosa*, Latin for nerved, referring to the usual obscurely nerved leaf laminae, is proposed rather than making a new combination from Mueller's *Canthium microphyllum* because the leaves of this variety are usually much bigger than those of *E. vacciniifolia* var. *vacciniifolia*.

Unplaced specimens of *E. vacciniifolia*

Canthium sp. (Massy Creek P.I. Forster + PIF 10568), (Reynolds 1997, p. 180).

The collections listed below probably represent another variety or form of this species, but are insufficient to be sure. They resemble *E. vacciniifolia* var. *vacciniifolia* in their short peduncles and pedicels, and *E. vacciniifolia* var. *nervosa* in their long flower buds with pointed apices. However, they have a different aspect from both these varieties in attributes of their branchlets, their subobovate or elliptic leaf laminae and the shape of their flower buds. As only three of the collections

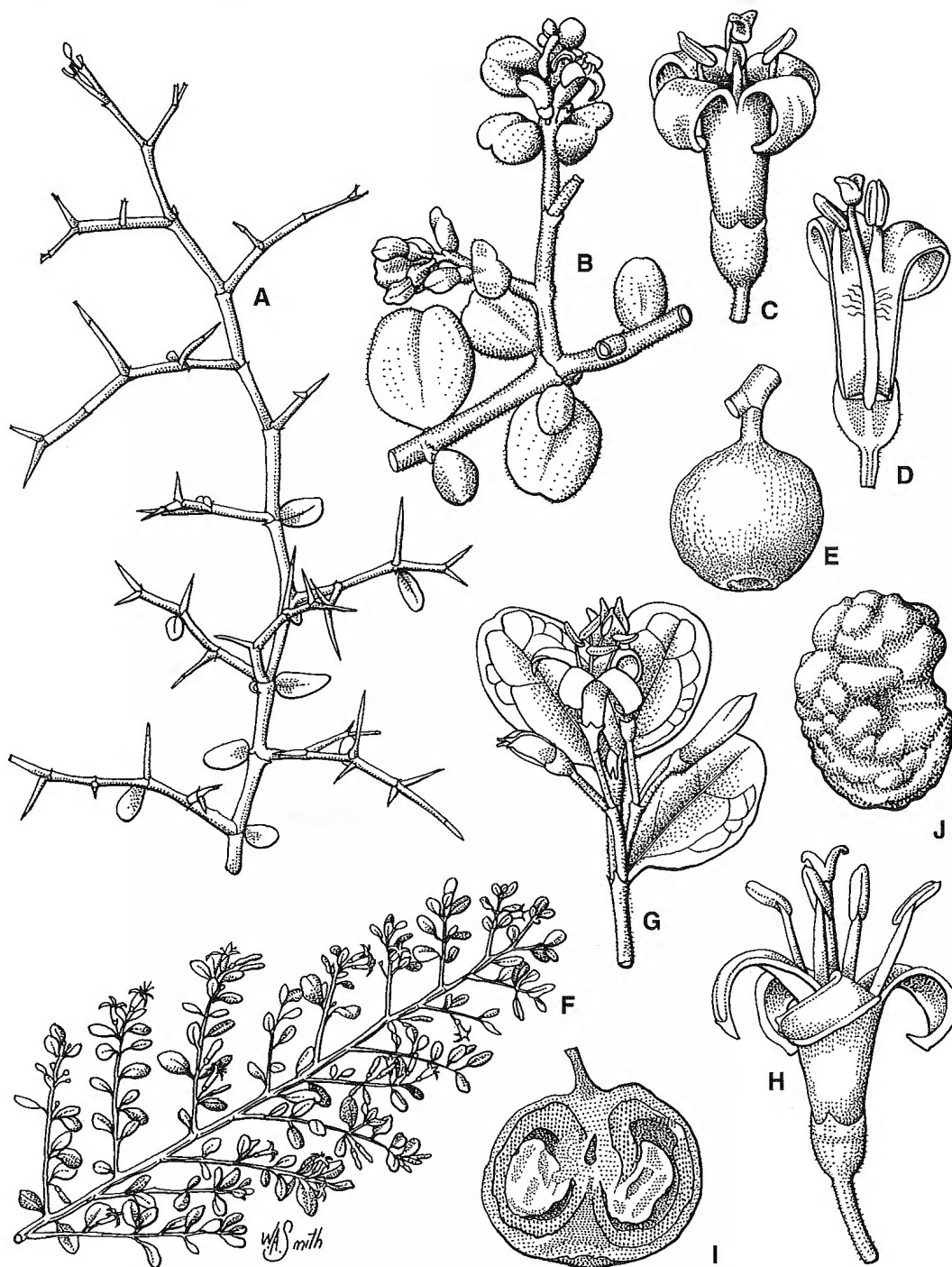


Fig. 1. A-E. *Everistia vacciniifolia* var. *vacciniifolia*. A. juvenile branch $\times 1.5$. B. portion of flowering branch $\times 2$. C. flower $\times 6$. D. longitudinal section of flower $\times 6$. E. fruit $\times 6$. (A from Myers s.n. (BRI [AQ 124017]); B-D from Forster PIF14111 (BRI); E from Forster PIF9097 (BRI)). F-J. *E. vacciniifolia* var. *nervosa*. F. flowering branch $\times 0.8$. G. detail of leaves and inflorescence $\times 3$. H. flower $\times 6$. I. longitudinal section of fruit showing embryos $\times 6$. J. abaxial view of pyrene $\times 9$. (F from Lebler 1978, p.530; G from Forster PIF12062 (BRI); H from Forster PIF4919 (BRI); I, J from Forster PIF3750 & Bolton (BRI)).

have a few depauperate flowers on them, and their leaves are also variable, it is not possible to be certain that they represent a taxon constantly different from the named varieties. If they do represent a distinct taxon, based on specimens available, it may be described as follows.

Shrubs 2–3 m high; branching spreading, flattened; branchlets, peduncles and pedicels finely hairy to glabrous; spines straight, leaf opposed or at apex of small branchlets, usually forked. Petioles 1–2 mm long; stipules small, ovate, apiculate; leaf laminae elliptic to subobovate, 5.5–9.0 (–18.0) x 3.5–9.0 (–16.0) mm, obtuse or retuse at apex, subacute at base, flat or slightly recurved at margins, \pm thin, coriaceous; adaxial surface shiny or with a slight sheen; midrib and 1 pair of lateral nerves usually distinct. Inflorescences 1–3-flowered; peduncles and pedicels 0.5–1.5 mm long; flower buds narrowly ellipsoid to narrowly obovoid, 5.5–7.5 mm long, with minute slender, acuminate, hairy lobes at apex; calyx indistinctly lobed, c. 1 mm long; corolla 6.0–7.0 mm long; tube cylindrical, 3.5–5.5 mm long, c. 2.5 mm wide at mouth, densely reflexed hairy at throat; lobes 2.5–3.5 x c. 1.25 mm, subacuminate; stamen filaments 0.5–1.5 mm long; anthers 1.0–1.5 mm long; style with stigma c. 3 mm long. Fruit ellipsoid, c. 5.0 x c. 5.5 mm.

Specimens studied: **Queensland.** COOK DISTRICT: Goode Island, in 1881, *Powell* 26 [MEL 1538045] (MEL); Cairncross Island, Aug 1855, collector unknown [MEL 1538072] (MEL); Moa Island, Thomas Swamp, Aug 1985, *Buchworth* 355 (BRI); Moa Island, Apr 1987, *Buchworth* 973 (BRI); Galloways Hill, 10°46'S, 142°28'E, Sep 1991, *Sankowsky & Sankowsky* 1234 (BRI); Weipa Rd, 83 km W of Cape York Development Rd, 13°14'S, 142°41'E, Jul 1984, *Puttock & King* UNSW 16975 (BRI); 5.5 km W of Lockhardt River turn off on Portlands Rd, 12°44'S, 143°15'E, Jul 1984, *Puttock & King* 16791 (BRI, UNSW); 6 km W of Rocky River mouth, 36.2 km ENE of Coen, Silver Plains Holding, Cape York Peninsula, 13°46'S, 143°29'E, Aug 1993, *Fell* 3480 (BRI); 5 miles (8 km) N of Crossing on Massy Creek Rd, below Silver Plains Station and Rocky River, Oct 1969, *Webb & Tracey* 9719 (BRI); 3 km N of Massy Creek Crossing, Silver Plains Station, 13°53'S, 143°31'E, Jun 1992, *Forster* PIF10574, *Sankowsky & Tucker* (BRI); ditto, *Forster* PIF10568, *Sankowsky & Tucker* (BRI).

Distribution and habitat: Cape York Peninsula, Queensland, including the Torres Strait islands; usually in evergreen vine thickets, on sandy beach ridges on fine white sand. Map 1.

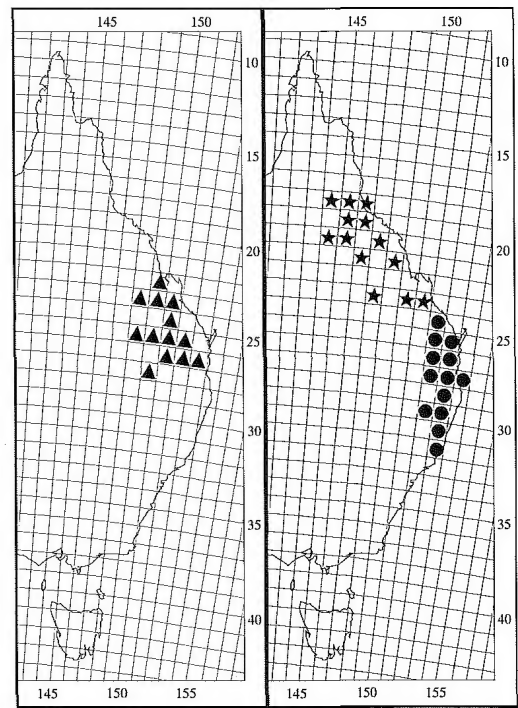
Notes: The leaf laminae in the above specimens are quite variable, being elliptic, thin, coriaceous and with slightly recurved margins in those from Massy Creek, subobovate, flat and thin in the Torres Strait Islands specimens, and flat, thick and coriaceous in the remainder. However, in their overall aspect and colour of branchlets and indumentum, the specimens appear to be from the same taxon and are, therefore, tentatively treated together. Examination of more specimens from the above areas is necessary before the variability and affinities of these collections can be fully assessed.

Acknowledgements

We thank colleagues at BRI especially Paul Forster for collecting specimens of many '*Canthium*' species and for their observations on the habitat of the species, Will Smith for the illustrations and maps, Directors/Keepers of AD, BM, CANB, CGE, DNA, K, L, MEL, NSW, P, PERTH, QRS, and UNSW for allowing me (STR) full access to specimens in their institutions and for the loan of herbarium material, and The Australian Biological Resource Study, Federal Department of Arts, Science, Sports, The Environment, Tourism and Territories for a grant (to STR) to undertake research in the genus *Canthium* in Australia.

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Map 1. *Everistia vacciniifolia* f. *vacciniifolia* ▲, *Everistia vacciniifolia* f. *crassa* ★, *Everistia vacciniifolia* var. *nervosa* ●.

Note

Contribution of isozymic analysis in differentiating *Macrozamia moorei* D.L.Jones and K.D.Hill from *M.johnsonii* F.Muell (Zamiaceae)

Macrozamia johnsonii D.L. Jones & K.D. Hill was recently segregated from *M. moorei* F.Muell. (Jones and Hill, 1992) based on morphological characters, in particular, differences in the seedlings and plant habit. Populations of the two species are also disjunct, being separated geographically by a distance of about 800 km with *M. moorei* found in the central highlands of Queensland around Carnarvon Gorge and Springsure and *M. johnsonii* west of Grafton in north-eastern NSW. While the two species are morphologically distinct they are nevertheless closely allied and may represent sister taxa. The opportunity is taken here to compare enzyme banding patterns of both species using isozyme analysis.

Starch gel electrophoresis was employed to determine the enzyme pattern differences between two populations of *M. moorei* (Mt Zamia Environmental Park, Forster, PIF 14081, n=14; Staircase Range, Forster and Machin, PIF 9766, n=14 and one population of *M. johnsonii* (2.5km west of Bobtail Road, P. Machin s.n. (AQ540376), n=14). Both species have a narrow geographic range. Samples were collected from population extremes of each species and the voucher specimens housed at the Queensland Herbarium (BRI). When an extract of leaflet was assayed, following the method of Wendel and Weeden (1989), different but consistently reproducible electrophoretic banding patterns were produced (Fig. 1) for four of the eleven anodal enzyme systems assayed namely: Diaphorase (DIA, E.C 1.6.4.3), Menadione Reductase (MR, E.C 1.6.9.92), Uridine Diphosphogluconic Pyrophosphatase (UDP, E.C 2.7.7.9) and Isocitrate Dehydrogenase (IDH, E.C 1.1.1.42).

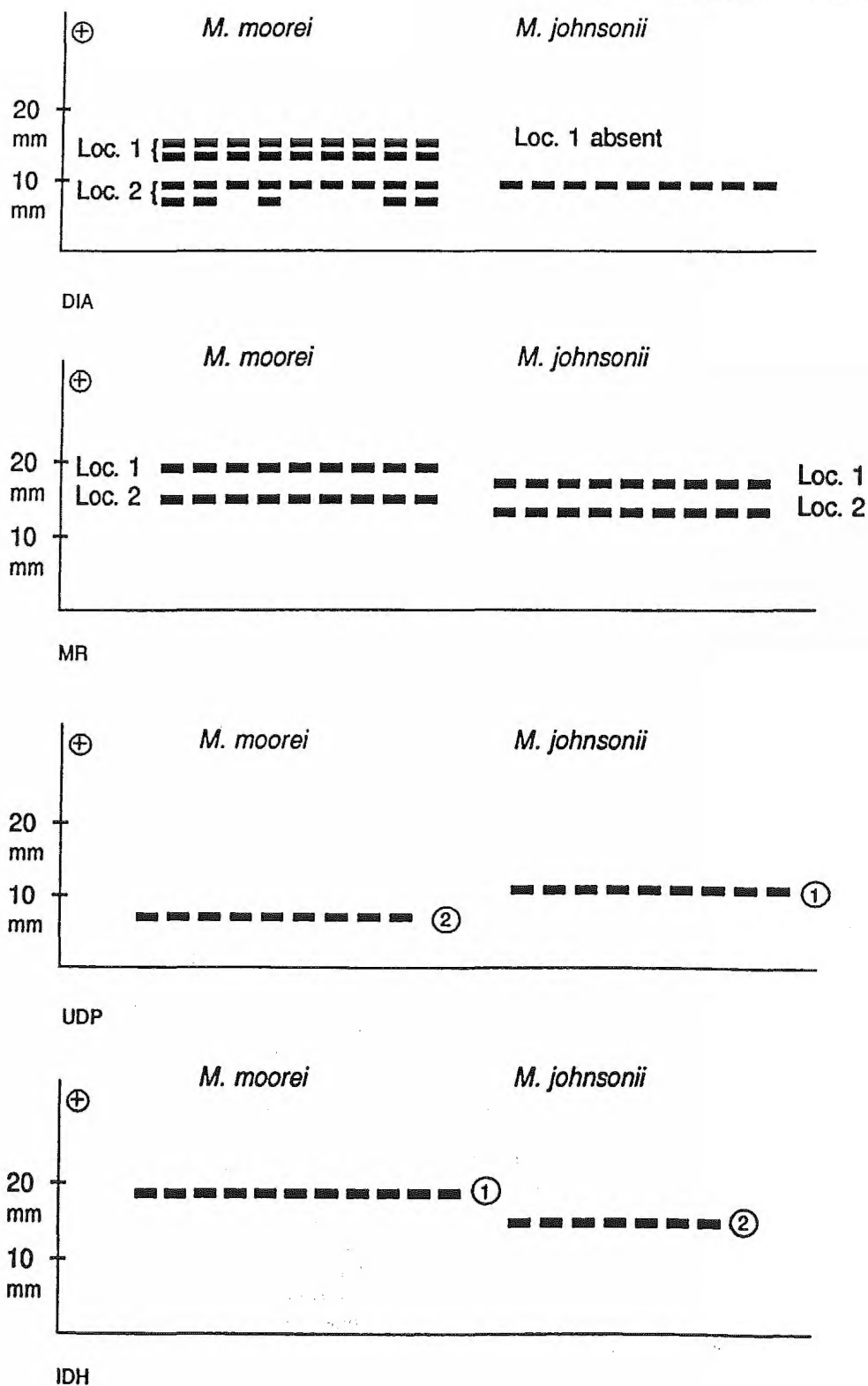
DIA: This monomeric enzyme exhibited a single band at locus one in all sampled plants of *M. moorei*, whereas the locus was absent in samples of *M. johnsonii*. At locus two *M. johnsonii* samples were monomorphic, but the locus was polymorphic in *M. moorei* with several of the plants examined being heterozygotes for the slower allelic variant.

MR: The two loci for this enzyme in samples of *M. moorei* and *M. johnsonii* revealed totally different positions and are presumed to be fixed for alternative alleles.

UDP: There were only two heterozygotes observed in samples of *M. moorei* with this monomeric enzyme (frequency of allele one =.07), the remaining samples being homozygotes at position two, whereas allele two was absent in samples of *M. johnsonii*, all being fixed at position one.

IDH: This dimeric enzyme produced only two types of homozygote zymograms. In all the samples of *M. moorei* examined, the locus was monomorphic at position one whereas in samples of *M. johnsonii* it was also monomorphic but at position two.

The absence of locus 1 in enzyme DIA for *M. johnsonii* and fixation of loci for alternate alleles in MR and IDH is deserving of further comment. There are three possibilities for these results to occur namely: (a) the same locus is present in both species but is fixed for alternative alleles at a different location (IDH, MR), (b) locus one for an enzyme DIA might be present but is fixed for allele overlapping locus 2 or a null allele or (c) there could have been two loci at IDH and MR in *M. moorei* and *M. johnsonii*, two loci at DIA in *M. johnsonii*, but one of them is presumed to have been lost during the course of evolution.



In assessing allelic variation at the same loci, Nei's genetic distance (Nei, 1978) was calculated between the three populations sampled. The genetic distance between two congeneric species is generally considered to be 0.4 (Gottlieb, 1977) and the genetic distance between *M. moorei* and *M. johnsonii* was 0.48 (average of two populations of *M. moorei*) which supports the previous conclusion of Jones and Hill (1992) based on morphology, that these are distinct species. The low levels of genetic variability observance in *M. moorei* and virtually no variability observance in *M. johnsonii* may be due to the fact that the populations have been derived from a small number of plants and lack of gene flow from other populations has resulted in independent evolution of *M. moorei* and *M. johnsonii* with divergence caused mainly by random genetic drift. The low number of polymorphic loci and heterozygotes found in individuals may be attributed to any of the following factors: (a) the small and localised nature of the population, (b) a genetic "bottleneck structure" due to lack of gene flow from outside the population, (c) inbreeding between individuals within taxa, and (d) low sampling level.

The results obtained here provide supportive evidence for distinguishing *M. moorei* and *M. johnsonii* as distinct species.

Acknowledgements

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Economic Interest

Suburban Weeds, Third edition by H. Kleinschmidt, A. Holland and P. Simpson (1996), 98 pp., illustrated, card cover.

Use of Fodder Trees and Shrubs by S.L. Everist (1986), 72 pp., illustrated, card cover.

Poisonous Plants - a field guide by R.M. Dowling and R.A. McKenzie (1993), 175 pp., colour illustrations and maps, card cover.

Special Interest

Rare and Threatened Plants of Queensland, 2nd edition by M.B. Thomas and W.J.F. McDonald (1989), 76 pp., card cover.

The Flora of Girraween and Bald Rock National Parks by Bill McDonald, Colleen Gravatt, Paul Grimshaw and John Williams (1995), 100 pp., colour and line drawing illustrations and maps, card cover.

Queensland Plants: Names and Distribution edited by R.J.F. Henderson (1997), 286 pp., soft cover

Wildflowers of South-eastern Queensland by B.A. Lebler.

Volume 1 (1977) 108 pp., illustrated, soft cover.

Volume 2 (1981) 83 pp., illustrated, soft cover.

Enquiries regarding the cost and ordering of these publications should be directed to Queensland Herbarium, Department of Environment, Brisbane Botanic Gardens Mt. Coot-tha, Mt. Coot-tha Road, Toowong Qld 4066.

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